ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

Electric Light, Power, Telephone, Telegraph and Scientific Progress.

VOL. 16, No. 17. WEEKLY. | NEW YORK, SATURDAY, JUNE 21, 1890. | $3 per annum. Single Copies, 10 Cents.

Copyright, 1890, by Electrical Review Publishing Company, 13 Park Row, New York.

Entered at Post Office, New York, as Mail Matter of the Second Class.

An Electric Hearing Tester.

Dr. Cheval, of Brussels, has devised a modification of Prof. Hughes' sonometer for testing the degree of deafness, and also for detecting the conscripts who plead deafness as an excuse for not serving in the army. He calls it the electric acoumeter, and it consists of three flat coils placed parallel to one another on a graduated rod passing through their axes. The center coil is the primary and is fixed, the two outer coils are secondaries, and can be slid along the rod. The rod and coils are arranged on a board, on which there are an electrical tuning fork, a microphone, switches, plug, and other accessories. The individual whose hearing is to be tested is placed with his back to the apparatus, and has two telephonic receivers fixed tightly over his ears. Various sounds are then produced; the two outer coils being moved gradually away from the center one until no noise is heard in the telephone receivers. The distance through which the coils have been removed is a measure of the hearing power of the individual. According to Dr. Cheval, a person gifted with a fine sense of hearing ceases to hear the telephonic vibrations of a tuning fork on the left side when the coil is 435mm. distant, and on the right side when the coil has been moved through 535mm. For less sensitive ears the distances are, respectively, 293mm. and 401mm. Deafness sufficiently pronounced to exempt from military service is represented by a distance of 100mm. Obviously it is no real test except when the subject gives honest answers.

Police Patrol Systems.

The Commissioners of the District of Columbia have awarded the contract for the police patrol system for the Georgetown precinct to the Municipal Signal Company. Their decision was based upon information contained in a report made by Capt. Rosell, of the Army Engineers, who examined the Gamewell system in Boston, Newton and Brookline, and the Municipal Companies' system in Boston, Providence and Newark, N. J. Capt. Rosell's report contains some important statements of general interest. It says "The Gamewell Company puts up two different systems. The one now in use in Washington is known as the 'Chicago' system. In this city but two signals are used to connect the police patrol box with the headquarters of the precinct, although others might be used, one being for the telephone and the other for the ambulance or the patrol wagon; the patrol wagon carrying a stretcher with it so that the same wagon is used for patrol and ambulance. In the Gamewell improved system, in addition to these two signals, the policeman can send from each box a report at such hours or at such times as may be designated, and a different report is used for each policeman using the box. In cities I have visited I found that as high as four policemen report from the same box. These reports, or as they are sometimes called 'duty calls,' register themselves automatically in ink. The hour and minute are also printed on the same tape, so that there is no necessity for any attendance on the table containing the apparatus. The reports are made up once or twice a day and furnish a daily report to be sent to the Chief of Police, by means of which he can fairly well follow each policeman through his tour of duty. In some cities, these reports are sent in by the policeman several times in an hour; in others only once in an hour, and in others only once in two hours. The more numerous these signals are the more nearly can a policeman be tracked on his route. Should a policeman, however, desire to send in a message on the telephone or ask assistance, when these signals are sent to the precinct headquarters, a bell is rung which continues to sound until some person goes to the operating table and attends to the business.

"The Municipal Signal Company furnish an apparatus which does all that the improved Gamewell system does; the only difference between the two is in the mechanism and the method of doing the work. The result of all the information I have gained on these subjects leads me to believe that either system, put in in its entirety, will give satisfaction, and that the contract should be let to the lowest bidder."

The Theatrephone.

Paris citizens will shortly be able, by dropping a half-franc piece into a slot, to hear a play or a concert. MM. Marinovitch and Szaravady have devised an apparatus for this purpose, which they have named the "Theatrephone," and they propose to introduce it into clubs and hotels. An experiment was made in Paris the other day, and was pronounced a very successful one.

Bright as Sunlight.

DESCRIPTION OF THE EDISON PLANT AT THE NEW MADISON SQUARE GARDEN.

Last Monday evening was thrown open for the verdict of a critical public, the largest place of amusement in the world. Within the walls of the new Madison Square Garden there are four distinct features, either of them usually occupying an entire building. These are the immense amphitheatre, a large theatre, a concert hall and a café. There will also be a roof garden and a very high observation tower, when the building is completed.

The amphitheatre was the portion used for the performance on Monday night. Entering on Madison Avenue, and walking up the slanting corridor, paved in mosaic patterns, we come abruptly upon the floor of the immense ellipse. The eye is immediately attracted to the beautiful trusses which support the arched roof. These steel trusses are of 186 feet span and are nearly flat in form. They are said to be the largest and lightest ever constructed. The ends of the great roof are oval and supported by radiating trusses which meet in a cluster. A sliding skylight forms the central portion of the

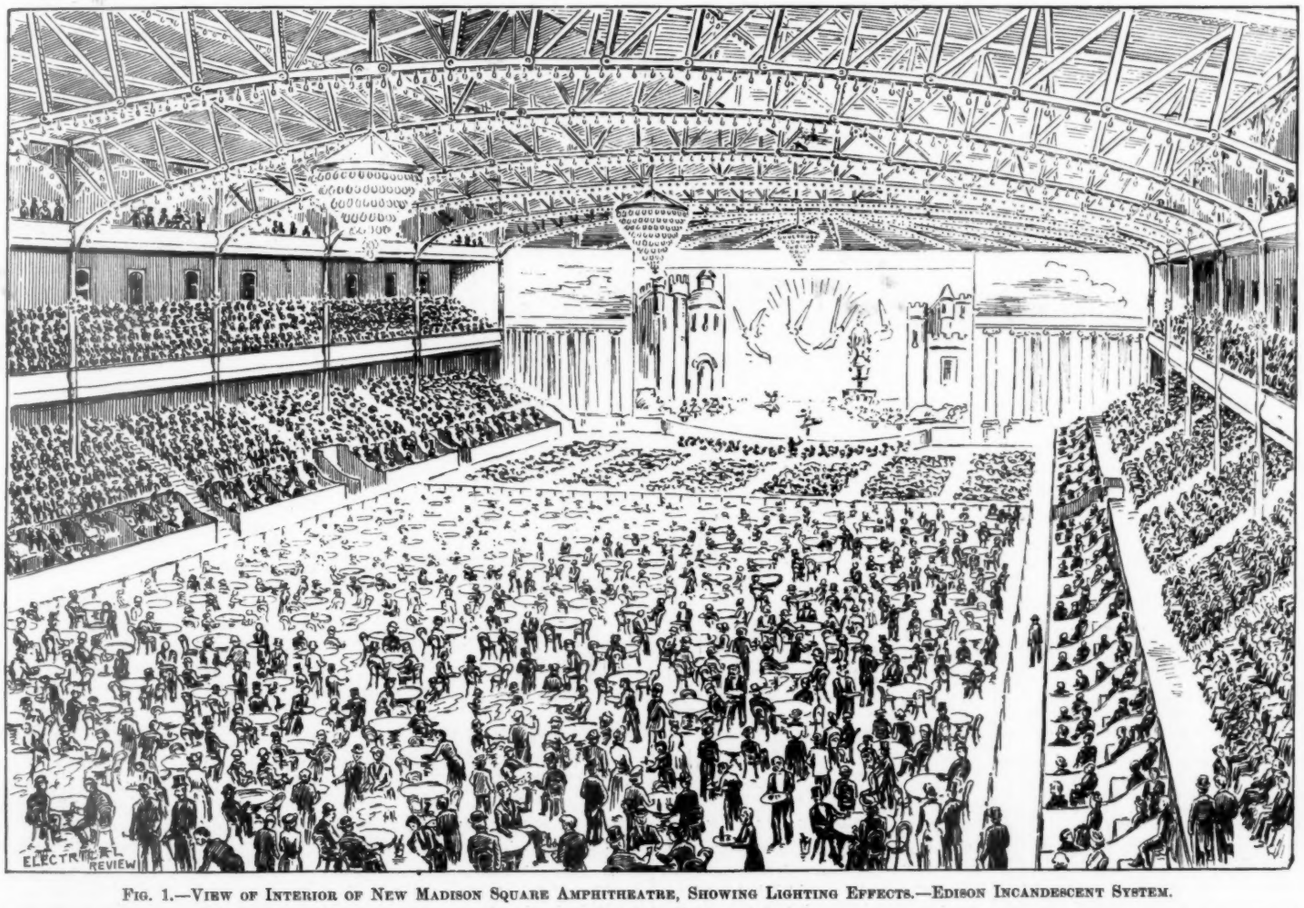


Fig. 1.—View of Interior of New Madison Square Amphitheatre, Showing Lighting Effects.—Edison Incandescent System.

roof. The arena is entirely open and free, the only obstructions being a row of light steel columns near the walls. The interior decoration is in a very light key, the prominent colors being white, gold and light terra-cotta. A true idea of the vastness of the place is not obtained until the spectator climbs the stairway to the promenade corridor, which completely surrounds the amphitheatre and is just beneath the roof. Looking down from this, one realizes more fully the size of the arena.

But how are we able to so thoroughly and distinctly discover every detail in the construction of the amphitheatre? It is owing to the well-nigh perfect illumination. From the promenade corridor, looking out and along the lower faces of the trusses, the roof seems to be aglow with light.

This is the feature of the interior decoration which more directly concerns the readers of the REVIEW, and with the help of the illustrations, the following description will be made plain.

At present current is supplied to the building from the Edison commercial circuits, but before long the isolated plant in the building will be in operation. This plant consists of four Edison incandescent dynamos which will light about 3,600 lamps to start with. These machines are known as the "No. 20" size. Power is supplied to them by two 250 horse-power New York safety straight line engines. The switchboard, when completed, will be a marvel in design. Any possible combination of lights may be effected, even down to lighting every alternate lamp in the building. The lamps are arranged so that a diffused effect is produced, there being practically no shadows. Wall brackets of neat and tasty design are used wherever required. On the columns supporting the trusses are cluster lights similar to but larger than those used in the Lenox Lyceum.

Strung along on each steel truss, 60 odd feet above the floor, are 104 Edison incandescent lamps. A piece of molding carrying the tap wires is clamped on the under side of the truss, and porcelain cut-outs with about six inches of wire hanging from them suspend the lamps. Five large chandeliers drop from the ceiling. The center one contains 600 lights, two others, one on each side of the center, contain 300 lights each, and two more, one placed at each end where the trusses supporting the ends meet, contain 50 lights apiece.

As before stated, there are at present in the building, 3,600 lights, but this number will undoubtedly be increased to about 6,000, making this one of the largest isolated plants in the country.

The Edison Electric Illuminating Company, through Mr. McLean, have handled the contract in their well-known energetic manner. Mr. W. B. Hadley, their superintendent of construction, has fairly outdone himself in this instance. To Mr. Gilbert, the foreman on the ground, great credit is also due. Mr. Hadley has limited himself to 12-light plugs, a fact which the electrician of the building will appreciate in case any "blow-outs" should occur. This makes the danger from fire almost an impossibility.

There are about 20,000 feet of the Interior Conduit and Insulating Company's conduits used in the construction work. This is another safeguard against fire. The wire used is all of the Habirshaw make, there being about 20 miles of it strung through the building. The smallest size is No. 16. One set of three-feeder cables is 400,000 circular mils in size and about 400 feet long. A second set is of 300,000 circular mils and 600 feet long. The work on the trusses was all done from the trusses themselves, no scaffolding being erected.

For the illustrations of the exterior of the building and the longitudinal section, we are indebted to the New York *Sun*. Our illustration of the interior conveys a general idea of the appearance of the amphitheatre on the opening night.

—— At the meeting of the Allegheny gas committee in Pittsburgh last week a number of improvements were suggested for the new electric light station. The odd fact was developed during the meeting, that when the plans were made out for lighting the city, the electric building itself was not considered. The superintendent was, therefore, ordered to wire the building for lights.

Jarman's Electric Car.

The electrically worked tramways in Great Britain are very few in number, but an addition will presently be made on the London Tramways Company's system, on which the Electric Tramcar Syndicate, Limited, 31 Lombard street, E. C., have arranged to run several accumulator cars. The inventor of the system is Mr. A. J. Jarman, who has got one car now in readiness, with which private trips have already been made with successful results. Some considerable time back the same inventor made many experimental runs with a car, and the experience derived from these trials has resulted in the practical development of the present system. The stretch of line on which the cars are to be worked is from Clapham Common to Tooting, on which some one in 25 gradients are met with, but the cars do not seem to find any difficulty in overcoming them.

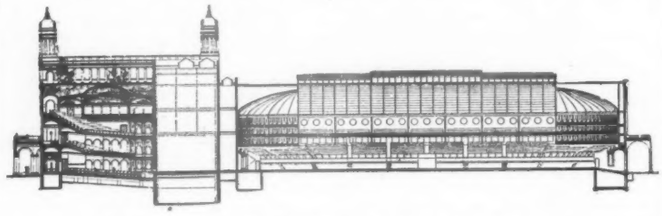


FIG. 2.—SECTIONAL VIEW OF NEW MADISON SQUARE GARDEN.

The car is of the same type as the ordinary horse cars on the line, with the exception that it stands a few inches higher. The accumulators are placed under the seats of the car, but instead of being put into position from the sides, as in the case at Barking, they are run in on trays from the ends. It is proposed to eventually use hydraulic plant for this purpose. As inconvenience would arise in inserting and withdrawing the cells simply through the hinged doors, corresponding doors are provided in the splash boards.

FIG. 3.—OUTSIDE VIEW OF NEW MADISON SQUARE GARDEN.

There are, in all, 52 double ebonite cells of the "E" type, 26 on each side, connected in series, the total weight being two tons. In order to provide ventilation for carrying off any fumes from the cells, hinged doors are placed at each end fitted with horizontal louvre boards. Access to the cells can be obtained from the interior of the car by lifting up the seats.

The motor is of a special and peculiar type. Two separate armatures are placed on a single shaft, so that one may revolve in one direction and do work, while the other revolves idly and dissipates heat acquired while running, by radiation in an induced current of cold air within the inert field magnet. Mr. Jarman's theory is that an electric motor, when applied to purposes of locomotion, cannot work efficiently when a single armature is employed, for the reason that greater power has to be developed in order to overcome the increased resistance when starting the vehicle from a position of rest, than is required to maintain the motion at the required rate of speed. The motor has, as already stated, two armatures and two bi-polar field magnets. It is carried in a steel frame, bolted to the body of the car, and also supported by the axles through the axle boxes. With a view to obtain exceptional power when making a start, the magnets have been wound in a special manner, termed the "gamut" winding. This consists in the cores being wound with layers of wire of varying resistances, and which can be either cut out of, or included in, the circuit by means of a suitable switch, the ends of each layer being led to the switch, so that each or all of them may be withdrawn or included, as already stated.

The gearing is also special. A wrought iron pinion, running at 650 revolutions per minute, is placed between the two armatures on the motor shaft. On the countershaft there is a mortice wheel, but the cogs, instead of being of wood, are of vulcanized fibre. Two flanges are placed on each side of the mortice wheel, and the cogs are sunk into slots. Holes are bored through the flanges on the pitch line, through each of which a pin is inserted, keeping the cog in place. The size of the mortice wheel is such as to reduce the revolutions to 216. Another wrought iron pinion on this countershaft gears into a second mortice wheel on the axle of the car, further reducing the revolutions to 90 per minute. These speeds obtain when the motor is running at its normal rate. The vulcanized fibre cogs have the effect of causing the car to run with a minimum of noise.

At either end of the car is a cylindrical case, containing the switch. The handle of the switch at the top of the case may be revolved in either a backward or forward direction—corresponding to a forward or backward movement of the motor. This operates the switch, which consists of a wooden cylinder placed upon a metal spindle. On the surface of the cylinder are fixed circumferentially strips of gun metal, of different lengths and widths. These are wide enough to form contact with any pair of contact tongues which represent the ends of the various layers forming the "gamut" winding. Between these strips are placed plugs electrically coupling the spindle with the tongues connected with the termination of the last layer that has been placed in circuit, a connection from the end of the spindle serving to couple the spindle to the brush or other part of the circuit, so as to complete it.

At normal speed one of the armatures is doing work while the other revolves without performing work. At half speed the motor is in series, and in full speed in parallel. The cars will be worked for the Tramway Company by the Electric Tramcar Syndicate at a rate not exceeding 4½*d.* per car mile.—*London Industries.*

As to "What is Electricity?"

BY PROF. A. E. DOLBEAR, OF TUFTS COLLEGE.

In that interesting book on "Modern Views of Electricity," by Prof. O. J. Lodge, there is made the suggestive statement that after all the inquiries which have been made as to What is Electricity? the answer may have to be, There is no such thing. The words "electric" and "electrification" may be retained, but the word "electricity" may have to go, simply because it does not stand for a reality. It may be difficult for one who looks at the phenomena, rather than to the relations involved in the phenomena, to imagine that electricity is not some sort of an entity and may be described, if one knew how, as one would describe any other something. It would certainly be curious if it should turn out that the reason no answer has been forthcoming to the question, What is Electricity? is that there is no such *thing*, and the question is an improper one; as if one should ask, what is odor, or brightness, or zero.

Historically there have been several parallel cases. An hundred years or more ago, heat phenomena were attributed to phlogiston or to caloric—each supposed to be an entity of some sort. The latter term is still retained for convenience, but it has ceased to have any significance as a something that gives origin to heat phenomena. When it was discovered that such phenomena were due to atomic and molecular vibrations, or what is now often called a "Mode of Motion," both the above words ceased to have any meaning; in other words there was no such thing as phlogiston or caloric. Again, light was once thought to be an entity; now we know that light is a sensation, and properly does not exist independent of the eye. What was treated as light is now called "radiant energy" or "ether waves." Though the the term "light" is retained it has lost the significance it had when it was supposed to be a created something.

The physiologists for a very long time explained the phenomena exhibited by living things, both vegetable and animal, as due to "Vital Force"—something supposed to be utterly unlike and not necessarily related to the other forces in nature—a force that could control the others in a living organization. Now that has been altogether abandoned. No biologist of any repute now believes in "Vital Force" and the question, What is life? which has always baffled every one in his attempt to define it, now turns out to be an improper question, as it is reducible to complicated molecular motions and not to an entity.

As magnetism is known to be due to the position of molecules; as chemism may be explained as due to ether pressure, it really seems as if all along the line of knowledge of the physical universe, what have been called "forces" as peculiar somethings, having individually, as matter has; have no existence at all, that matter and ether and motions of one sort or another are all the factors in phenomena.

Lodge's statement then has a degree of probability added to it by the antecedents in the history of physics.

There is one more fact which might be mentioned lying along in this same path. I thought at first I would point it out and comment a little upon it, but if any one is interested in this line of thought he will soon see the bearings of the above, and may make his own comments, do his own thinking, and come to his own conclusions.—*Practical Electricity.*

JEST FOR FUN.

The telegrapher is likely to be an honest man; yet he gets his living on tick.—*Boston Post.*

Electricians ought to make good soldiers. One man alone has been known to charge a battery.

Can you call a pitcher and catcher, reserved by a base ball club from one season to the next, a storage battery?

Factory Foreman (in angry tones)—"What have you done? Did you cut that copper wrong?"

Workman (humbly)—"N-o. I-I only cut off my fingers."

Jay Gould has secured control of the electric clocks at St. Louis. Jay may obtain a corner on time, but there is still a doubt as to his ability to copper eternity.—*Kansas City Star.*

VERY DANGEROUS.

"You had better be careful about your remarks concerning Mr. C——s B——r," said one Electric Club man. "He might challenge you."

"That doesn't worry me."

"He has the choice of weapons."

"What of it?"

"He might select two of those cigars he smokes. You know he is used to them."

"Gracious! I feel as if I had been drawn through a hole!" said the Telephone Cable, as it emerged into the dim light of a manhole.

"Nothin' funny in that," replied the Hemp Rope, pointing to the soldering torch, "Wire you kickin'?"

"When the workman grabbed at my head, I duct; but he caught me and playfully remarked, 'Don't try to get away! You conduit!'"

"That all?"

"No; I'm in love with a wind-lass. Tried to hug her, but the pesky men walked all around her and kept giving her a twist. Made me feel like shuffling off the mortal coil."

"A-hemp!" coughed the Rope, "so that's the way the wind blows." But at this juncture the conversation was cut short, as the blockade in the street was broken and work was resumed.

Women and Telegrams.

A woman never gets over her nervous terror of a telegram, says the New York *Evening Sun*. No matter how familiar it may be to her, a sudden terror always clutches her as she takes the unopened envelope in her hand and declares that she has "felt in her bones all day that something dreadful was going to happen to her." And by and by, when she gets the courage to open the sinister missive, she looks up at you with a "teary" smile and says: "Tom and Lucy will be here to-night. How glad I am! And how foolish I was! I never will be again." But she will—the very next time.

That is what a little women out Harlem-way is saying now. And "next time" hasn't yet come to confute her. And this is why she is saying it. Last week she went out of town to attend a wedding. It was on that awful hot Thursday. The hour for the ceremony drew nigh; the guests were all assembled, and no one so gay as she. Suddenly, into the midst of the joy skulked the uniformed figure of a messenger with a despatch. It was for the little woman, who, when she caught the first glimpse of it, straightway fell to sobbing and to laughing and to begging some one to catch her, because she was going to faint, and to telling between gasps how she was perfectly certain John had been sunstruck, because he always was sensitive to heat, and that she had known all day that something horrible was going to happen to her. And then she paused long enough to ask somebody to open it for her, please, and all the guests gathered silently and sympathetically about and sadness fell upon their souls, while the parsou himself opened the envelope and read in prayer book tones: "Mrs. Susan Brown. Where are my Summer trousers.—John?" But Mrs. Susan finds no excuse for John.

Kemmler's Fate.

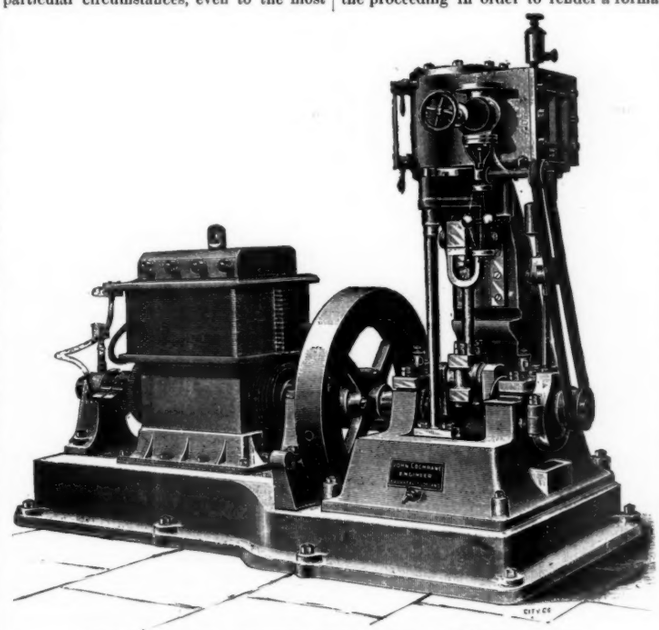
At Syracuse, N. Y., on June 11, Judge Wallace, on motion of Attorney General Tabor, vacated and dismissed the writ of *habeas corpus* in the Kemmler case. The attorney-general appeared in behalf of the Agent and Warden Durston, of Auburn prison. Judge Wallace, after reciting the facts of the issuing of the writ, says:

"Now, since the Supreme Court of the United States has decided that the sentence under which Kemmler is held is due process of law, and that he is not held and detained contrary to the Constitution of the United States, the writ is recalled and dismissed and Kemmler remanded to Agent and Warden Durston's custody, in order that the judgment of the Court of Oyer and Terminer may be duly executed."

The following is Judge Wallace's memorandum:

This writ has served the office for which it was allowed, and there is no reason why it should longer remain in force. It was allowed because there seemed to be a question whether the sentence under which Kemmler was about to be put to death did not offend the Fourteenth Amendment of the Constitution. This was a question which could only be finally decided authoritatively by the Supreme Court of the United States. If it had seemed to be a question so frivolous as not to be worthy of serious discussion, the writ would not have been allowed, but, unless it was thus frivolous, it was not for a judge of this court to refuse it under the particular circumstances, even to the most depraved criminal, and thereby deny him the chance which the statutes of Congress had given him to challenge the validity of his sentence. The writ of *habeas corpus* is of the highest light. The application for it is addressed, not to the discretion of the judge, but peremptorily. It cannot be denied, because the application has been unreasonably delayed, or because the most serious inconvenience may result from its allowance, and it is wholly immaterial whether the applicant is held in restraint by the wanton act of an individual or by the highest judicial authority. While the office of the writ is not to review mere error, it does not extend to jurisdictional error, and reaches any sentence which contravenes the organic law of the land.

In the very recent case of Medley (10 sup. ct., Rep. 384), who was convicted of murder and sentenced to death by a State Court of Colorado, the Supreme Court of the United States ordered his discharge by the State authorities because the statute under which he was sentenced was forbidden by the Federal Constitution. A formal application was made for the present writ on the 25th day of April last, based on a verified petition setting out that Kemmler was confined and sentenced to death and might be put to death any moment under a law of the State of New York which violated the Constitution of the United States, because it inflicted a cruel and unusual punishment for the crime of murder, to wit, by the application of electricity. The purpose of the application was to enable Kemmler to have the question whether the law was unconstitutional decided by the Supreme Court of the United States. If the writ had been refused, an appeal from the decision refusing to allow it would have been unavailing to Kemmler, because he would have been dead. It was not improbable, however, some other convicted murderer under sentence in this State might apply for a similar writ, and in that case, although the writ should be refused he could appeal as a matter of absolute right, to the Supreme Court, and as soon as this was done all proceedings against him in any State court or by any State authority would be null and void as to any matter in progress of determination under the appeal (U. S. Rev. Statutes, sections 763, 764, 766; 23 statutes, law page 437). If that had happened, the authorities of the State would have been placed in a very awkward dilemma, because an appeal could not be brought to hearing before the October term of the United States Supreme Court. It seemed desirable, therefore, to have the question finally settled as speedily as possible, and the writ was allowed, subject to the understanding with the counsel for Kemmler, that the question presented by it should be promptly brought to the attention of the Supreme Court, and that the writ should be vacated unless this was done, and the action of that court should seem to render a further prosecution of the writ expedient. This has now been done, and the Supreme Court has decided, after argument and consideration, that there was no Federal question in the case, and that the punishment authorized by the State law is not cruel and unusual in the legal sense. It would, of course, be the duty of this court to follow that decision upon the return day of the writ, and it will no longer serve any useful purpose to delay a disposition of the proceeding in order to render a formal decision at the regular term of the court. The motion to vacate the writ is granted.



SIEMENS DYNAMO COMBINED WITH ENGINE, FOR MARINE WORK.

Combined Engine and Dynamo.

Our engraving shows a combined engine and dynamo for electric lighting, as fitted on board the steamship "Monte Video," by the maker, Mr. John Cochrane, engineer, Barrhead, near Glasgow. The engine is of the single cylinder high pressure type, having a 9¼-inch cylinder and 8½-inch stroke, making 310 revolutions per minute. The engine and dynamo are on one bed plate, and the dynamo is coupled direct to the crank shaft. Several sizes of these engines are made by Mr. Cochrane, both simple and compound, with and without automatic expansion gear. The dynamo is made by Messrs. Siemens Brothers and Co., Limited, London, and is a Siemens horizontal bar, 12/20½ compound wound self-regulating continuous current dynamo, capable of giving 65 volts and 185 amperes at a speed of 310 revolutions per minute, which is equivalent to 185 sixteen candle-power incandescent lamps. The armature is of the usual Siemens drum pattern, with bar conductors. The magnets are of soft wrought iron, and they are magnetically insulated from the bed plate by massive brass feet. We may mention that this is the usual type of dynamo which is supplied by Messrs. Siemens Brothers for ship lighting, and is extensively used in the Royal Navy, for which upwards of 60 dynamos are at present under construction by this firm. We understand that these combined engines and dynamos have given most satisfactory results.—*London Invention.*

Geneva, Ohio.—The Geneva Electric Light ing Company; capital, $15,000.

Townsend, Mont.—The Castle Mountain Telephone Company; capital, $12,500. Directors, Wm. Bogy, Walter Peckam and Jean Brug.

St. Louis, Mo.—The Primary Battery Company, of Missouri; capital, $50,000; incorporators, Frank Stilwell, Wm. Steele and Edward Cheney.

Chicago, Ill.—Illinois Electric Transmission Company; capital, $1,000,000, incorporators, Wm. F. Sherman, Wm. S. Brewster and Stephen P. Gardner.

Tonawanda, N. Y.—The Tonawanda Electric Railway Company; incorporators, J. C. Conway, E. H. Butler, W. F. Wendt, Peter McNeil, E. H. Roger and others.

Madison, Wis.—Lake Geneva Water and Light Company; capital stock, $40,000; incorporators, James E. Heg, Edward P. Wheeler and James C. Reynolds.

San Francisco, Cal.—The National Electrical Development Company; directors, George A. Davis, John C. Turner, H. C. Miller, C. D. Cushing and C. J. Fallon.

Chicago, Ill.—Adams Company; to purchase or control patents for electric and elevated railroads; capital stock, $200,000; incorporators, J. W. Adams, G. W. Griggs and G. M. Harris.

Streator, Ill.—Streator Gas and Light Company; to furnish electric light to the city of Streator; capital stock, $100,000; incorporators, W. R. Gillett, Evan H. Hughes, S. T. French.

Spokane Falls, Wash.—The Spokane Electric Transit Company; the object being the construction and operation of an electric system throughout the city of Spokane Falls. The capital is $100,000.

Atchison, Kan.—The authorized capital of the electric street railway company is $400,000. The directors are: Geo. Storch, W. W. Hetherington, W. L. Challiss, H. J. Ransom, Alexander Hastie and W. H. McConaughy.

Binghamton, N. Y.—The Binghamton Electric Light & Power Company; capital, $200,000. The trustees are George J. Morse, of Hyde Park, Mass.; Col. G. W. Dunn, Geo. F. O'Neil and John Anderson, of this city; W. H. Roberson, H. F. Roberson and Frank Steny, of Albany.

Duluth, Minn.—The American District Telegraph Company; capital, $50,000. The incorporators are Henry C. Hope, Wm. H. S. Wright, James B. King, Samuel B. McConnell, Samuel Dearing, Solon S. Perrin, St. Paul; Geo. C. Howe, Duluth, and these gentlemen compose the first board of directors.

Brooklyn Institute.

The Department of Electricity of the Brooklyn Institute, last week held its regular meeting in the large lecture hall of the Institute. Like its preceding meetings, this one was very largely attended.

The main feature of the evening was the reading of a paper on Electric Railways, Present and Future, by Joseph Wetzler, of New York. The lecture was fully illustrated by lantern slides of much merit.

The paper was an exhaustive account of the future in store for the electric railway. There was still a field for the electric railway, the speaker said, beyond the mere street traffic, that will assume great proportions, and that is for branch roads of steam railroads.

In closing, he said the electric car and railway system of ten years hence will be quite unlike that of the present time.

ELECTRICAL REVIEW

Published at 13 Park Row
P. O. BOX 3329.

GEO. WORTHINGTON, - - Editor.
CHARLES W. PRICE, - Associate Editor.
ROBT. H. READ, Manager Patent Bureau.

REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.

"546 JOHN," TELEPHONE CALL.

BOSTON OFFICE:
W. I. BARKER, Room 29, 620 Atlantic Ave.

WASHINGTON OFFICE:
GEO. C. MAYNARD, 1419 New York Ave

CHICAGO OFFICE:
D. B. DEAN, 61 Metropolitan Block.

EUROPEAN OFFICE:
CHARLES FFRENCH, Bridge House,
181 Queen Victoria St., London, E. C.

SUBSCRIPTION TO THE
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy. - - - - .10

ANNOUNCEMENT.

Address all communications and make all money orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

No attention will be paid to communications for the REVIEW without the *name and address of the writer.*

NEW YORK, JUNE 21, 1890.

CONTENTS.

PAGE.

An Electric Hearing Tester 1
Police Patrol Systems 1
The Theatrephone 1
Bright as Sunlight 1
Jarman's Electric Car 2
As to "What is Electricity?" 2
Jest for Fun 3
Women and Telegrams 3
Kemmler's Fate 3
Combined Engine and Dynamo 3
New Corporations 3
Brooklyn Institute 4
The United States is Evidently not a Monarchy 4
Electricity *vs.* Steam 4
Correspondence:
Our Washington Letter 5
Our Chicago Letter 5
Our Boston Letter 5
Personal 5
Double Carbon Lamp 5
The Latest Kemmler News 5
Telephonic News 6
Telephone Officials 6
If You Call You Must Pay the Telephone 6
A New Danger Signal 6
A Telegrapher's Deserved Promotion 6
Thought He Saw Everything 6
Interior Conduit and Insulation Company 6
Those Telegrams 7
The Economic Flux Bulb 7
Western Telegraphers' Tournament 7
No Electricians Wanted 7
Telegraphic 7
A New Brontometer 8
Electric Power 8
Brooklyn Wants It 8
The French Copper Syndicate 8
The Utica Belt Line Railway 8
A New Ventilating Fan 8
Another Fight 8
Pillar of Flame on Broadway 9
Working Railways by Electricity 9
Automatic Wire Calculator 9
A Big Electric Light Station Struck by Lightning 9
The McLaughlin Storage Battery 9
A Deserved Recognition 9
Electric Light News 9
Electric Clubs:
New York Electric Club 10
Chicago Electric Club 10
Boston Electric Club 10
An Interesting and Important Use of Electric Power 10
Bury the Wires! 10
Electricity is King 10
Kindred Interests 11
Telephone Rights in South America 11
Electrical Patents 11

INDEX OF ADVERTISERS.

COVER PAGES.

PAGE.

Ansonia Brass & Copper Co 4
Armington & Sims 4
Bridgeport Brass Co 4
Brush Electric Co 3
Davis, Charles H., Electrical Engineer 4
Day's Kerite Insulated Wires 4
Eastern Electric Cable Co 4
Edison Pressure Recording Gauges 4
Electrical Books 2
Hampson & Co., E. P 4
Jewell Belting Co 4
Moore, Alfred F 4
Okonite Co 4
Simplex Electrical Co 4
Standard Underground Cable Co 4
Tucker Electrical Construction Co 4

INSIDE PAGES.

Aluminum Battery Electric Light & Power Co 26
American Bell Telephone Co 19
American Circular Loom Co 13
American Electrical Works 12
Baker & Co 12
Ball Electric Light Co 19
Ball Engine Co 14
Baxter, H. E. & C 24
Bishop Gutta Percha Co 25
Blanchard, C. M 12
Brown Electric Protector Co 25
Brownlee & Co 18
Buckeye Engine Co 14
Burton Electric Co 19
Butler Hard Rubber Co 13
Cary & Moen 26
"C. & C." Electric Motor Co 16
Central Electric Co 18
Chadbourne, Hazelton & Co 26
Columbia National Bank 11
Clark Electric Co 13
Dwight Slate Machine Co 19
Eddy Electric Manufacturing Co 25
Edison Lamp Co 23
Edison Machine Works 24
Edison Manufacturing Co 16
Electrical Safety Co 23
Elektron Manufacturing Co 13
Empire China Works 19
Empire City Electric Co 17
Eugene F. Phillips Electrical Works, Ltd 12
Eureka Tempered Copper Co 22
Excelsior Electric Co 21
Faraday Carbon Co 22
For Sale 11
Fort Wayne Electric Co 28
Foundry & Machine Department, Harrisburgh Car Manufacturing Co 14
Garvin Machine Co 14
Goodrich Rubber Companies 22
Gordon & Co., W. H 12
Great Western Electrical Supply Co 27
Greeley & Co., The E. S ..... 12 & 24
Hazeltine & Stanley 23
Heisler Electric Light Co 26
Holmes, Booth & Haydens 21
Horn, Brannen & Forsythe Manufacturing Co 17
Illinois Electric Material Co 25
Interior Conduit & Insulation Co 17
Jarvis Engineering Co 14
Lane & Bodley Co 22
Leclanche Battery Co 12
Leffel & Co., James 18
Lehigh Valley Creosoting Co 24
Lynch, E. T., Jr 12
Macfarlane & Co., Wm 12
Marshall, Wm 11
Messner, C. W 11
Mitchell-Vance Co 26
National Carbon Co 19
National Electric Light Association Proceedings 19
National Electrical Manufacturing Co 13
Newark Machine Tool Works 12
New England Butt Co 14
New York Belting and Packing Co 22
New York Insulated Wire Co 17
Ostrander & Co., W. R 12
Page Belting Co 26
Palermo Mica Co 14
Parker-Russell Mining and Manufacturing Co 22
Partrick & Carter 18
Phœnix Glass Co 19
Phosphor-Bronze Smelting Co., Ltd 23
Pond Engineering Co 14
Queen & Co., James W 12
Rice Automatic Engine 14
Ricketts Co., Limited (F. M.) 13
Royce & Marean 22
Santley & Co., W. R 19
Sawyer-Man Electric Co 27
Scheverling, A 19
Schuyler Electric Co 23
Seely & Taylor Manufacturing Co 24
Shultz Belting Co 18
Solar Carbon & Manufacturing Co 18
Southern Electrical Supply Co 18
Sperry Electric Co 22
Sprague Electric Railway & Motor Co 10
St. Louis Electrical Supply Co 23
Stephenson Co., John 24
Stevens & Babcock 25
Thackara Manufacturing Co 25
Thomson-Houston Electric Co 15
Trinidad-Heimann Insulated Wire Co 19
Typical American Telephone Co 16
Tucker Electrical Construction Co 28
United Electric Traction Co 21
United States Electric Lighting Co 20
Vincent & Co., Charles R 14
Washburn & Moen Manufacturing Co 29
Washington Loan & Trust Co 11
Washington Electric Conduit Co 11
Watson & Stillman 24
Western Electric Co 22
Weston Electrical Instrument Co 26
Williams & Potter 14
Wilson & Co., R. D 11
Wyckoff Pipe Co 12

Last week's REVIEW was a pretty good one to get out right in the hot spell.

During the dull summer season is a good time for the metropolitan theatres to apply electric door openers to their places of exit. A certain Boston theatre is arranged so that by pushing any one of eight electric buttons placed in different parts of the house, 17 sets of folding doors fly open. The public appreciates these improvements.

The Postmaster-General of Great Britain has sent forth an edict forbidding the telegraph operators in the United Kingdom to hold meetings unless an official stenographer is present to take down and report to him exactly what every speaker says. The men contend that, when off duty, their time is their own and that it is none of the postmaster-general's business what they do. Fancy an American operator submitting to such autocratic restrictions!

The amount of copper used by the various electrical companies would furnish interesting food for the statistician. Here are a few figures: The Edison Lighting Company has about 530 tons of copper wire buried in the streets of Boston. The New England Telephone and Telegraph Company have in underground service nearly 260 tons of copper. The American Telephone and Telegraph Company use about 900 tons. The Thomson-Houston Electric Company have built electric railways which took over 700 tons of copper. Then think of the immense quantity of copper used by the wire makers, as set forth in our Industrial Supplement, issued with last week's REVIEW.

Cape May will be the Mecca of the electrical men next August. Likewise of the electrical ladies, for it is a mean man who won't take his wife to an Electric Light Convention when it is held at Cape May.

We have in our possession some sections of wires and cables which were taken out of the subways near the "fiery pit" mentioned in another column. The heat has entirely destroyed every bit of insulation and killed the copper, which has probably united with the tin coating on the wire and formed a very low grade brass. The heaviest cable will snap and break under slight pressure.

The words of commendation we have received over the last issue of the REVIEW and its eight-page "Industrial Supplement," were many and most highly complimentary. It was an issue we modestly think that the electrical field appreciated and found of special value. Although printing a large extra edition, we were unable to fill more than half the orders received.

The *Engineering Review* presents, in its issue of June 7, a graphic map and table, showing the lines of railway equipped for heating the cars by steam. The table gives the record of 86 different companies using steam heat, controlling a total of 91,443 miles of railway and having nearly 7,400 cars (or about one-fourth of the total passenger rolling stock in the country) equipped for steam heating. It is evidently only a question of a few years when all the roads will be equipped with steam, and the horrible burning of passengers in collisions become past history.

A New York evening paper, in an account of the destruction of an electric lighting plant by lightning during the recent storms, says that "the dynamo, which had been in use but five months, was ruined by the heat, and the operator was knocked down by the shock." We have heard of telegraph operators and of typewriter operators, and of various other kinds of operators, but this is the first time we have seen any reference to a dynamo operator. If the engineer who has charge of that dynamo read the account of his misfortunes that we quote from, he must have suffered a second shock almost as bad as the first.

An incident which considerably surprised the electric light men present, was the appearance of the mayor of this city, accompanied by some of his political associates, at the anticipatory Fourth of July celebration at Fulton and Broadway last week. What he wanted to be present at the "hellish orgies" for, is unknown, but it may have been from one of two reasons; either satisfaction at the destruction being wrought or possibly remorse at having ruthlessly cut down the overhead wires and thrust them underground. As long as the body of this island is permeated and soaked with sewer and illuminating gas, subways will be unsuccessful and these explosions and conflagrations may be expected at regular intervals. The electric companies are already hampered by the increased cost of their circuits underground. It is too much for even this city to expect them to put in expensive ventilating plants, which is the only means, and that a doubtful one, of rendering subways safe under the existing conditions.

THE UNITED STATES IS EVIDENTLY NOT A MONARCHY.

A few days ago, the President found it necessary to have a special telephone wire to communicate with the Secretary of State, but he could not have it without the permission of the Commissioners of the District of Columbia, and, as the Commissioners had some doubts as to their authority, under the present law of the District, to grant permission for the construction of a new line to a person who was not in the electric wire business, the matter was referred to the legal officer of the District for an opinion. It is to be hoped that a war with some foreign government may not be precipitated by the delay in settling this question.

ELECTRICITY VS. STEAM.

Our esteemed contemporary, the *Railway Review*, in discussing the question of adaptability of the electric motor as a substitute for the steam locomotive, first assumes certain arguments and supposed facts relating to the application of the electric motor, and then, with a suave sweep of the pen, dismisses the subject with the expectation that some of the new elevated railways and suburban surface railways may one day be operated by the electric system.

The first point attempted to be made by our contemporary is that at present the prices asked by manufacturers is prohibitive, and comparative figures are reached by assumption. But what ground is there for such assumptions? At present the electric locomotive is hardly in commercial existence. But even if it were, it must be remembered that its functions are, in comparison with the steam locomotive, high speed and high efficiency. An electric system in which the coal consumption is below two pounds per horse-power, and where the efficiency is fairly good, will compare very favorably with the steam system in which the coal gets up to five pounds per horse-power hour. Besides, when the electric motor starts and stops, coal consumption keeps pace with it, which is by no means the case with steam locomotives. But, in addition, comes the advantage of high speed, and this brings us to the second point in our contemporary's argument.

Here again is made a false start in assuming that manufacturers propose to equip cars with individual motors, and comparing on car-mile basis for a year's run. We do not believe it is seriously proposed by any competent electrical engineer to sub-divide the tractive effort. There is no difficulty to-day in constructing an electric locomotive of 800 or even 1,000 horse-power for use on railways. It is not done because, first, manufacturers are driven to their utmost capacity on smaller work, and, second, there is no demand as yet. But if a steam freight locomotive runs 35,000 miles per year, including time lost in repairs, side tracking because of speed limitations, there is every ground for the assertion that an electric locomotive could make a record average of several times as much, if hauling the same train; the yearly average would grow still more if the trains were shorter and lighter and the speed proportionately greater.

Under such conditions, our contemporary's figures fail, and for the same reason its first argument falls to the ground, because a considerable reduction in the cost of transportation per ton mile, if attained, would outweigh the objection of even 100 per cent. increase in first cost of locomotive. Does our contemporary for a moment believe that a railway corporation would hesitate to pay double the present cost for a steam locomotive if it could be sure of doubling the speed and, therefore, its mileage?

The whole subject is undergoing a calm and careful scrutiny by our most progressive electrical engineers, and when a line for traffic at high speed is finally constructed and operated, as it will surely be, it will work, and work so successfully as to sound the knell of the steam railroad in a great number of cases.

We cannot close without referring our contemporary to a careful analysis of the general subject contained in a recent paper entitled "The Limitations of Steam and Electricity in Transportation," by Mr. O. F. Crosby. The paper is most elaborately and ably drawn, and is altogether a most valuable addition to the meagre literature we have which touches the underlying truths on the subject. We do not agree with all the author's assertions and assumptions, but we believe them to be, in the main, correct and all his allowances to steam to be liberal, while his propositions as to electric possibilities are conservative and in keeping with actual practice.

The modern electric motor grows bolder and stronger every day. Only a few years ago it stretched out a feeble arm and took hold of sewing machine shafts and ventilating fans, and its modest performance was one of the interesting sights of the Philadelphia Electrical Exposition. Its tentacles multiplied and lengthened and strengthened, and, to-day, it has laid its inextricable magnetic grasp on hundreds of commercial industries, and its output in power is of leviathan proportions.

Street railways are to-day operated by electric power to far better advantage than is possible with horses, steam or cable transmission, and with more satisfaction to the patrons and profit to the owners. It is, of course, a long step from this to trunk line railways and freight transportation; but so it was from the sewing machine to the street car at double the speed of horse traffic; yet the step was made. So will the longer step, because the ground is becoming more familiar.

It takes time for such radical changes, but the change will be made. Modern progress will demand it sooner or later, the all-powerful stockholders will in time insist upon it, and electric haulage will reach its zenith.

CORRESPONDENCE.

Electrical Happenings in Washington, Chicago and Boston.

OUR WASHINGTON LETTER.

The Metropolitan Railway Company has, for some time past, been making one trip per day with its storage battery car, which is equipped with Accumulator Company's batteries and Mailloux motors, in the regular business of carrying passengers. No difficulty has been found in carrying heavy loads over the hardest portions of the line. So far the company has not taken any special care to ascertain the exact cost of running the car, its first object being to secure a motor car that would do the work in the best manner. It will now begin to keep accurate records of every item which enters into the cost of construction and operation, with a view of using this system on the whole road if further experience warrants the change. A significant fact in connection with these experiments, is that all the drivers on the road are anxiously hoping that electricity will succeed and relieve them of the trying task of driving horses.

A few days ago an application for a charter for the East Side Railroad was introduced in the Senate. The charter, as drawn, provides for the use of any motive power that does not require the use of overhead wires, but the object is to equip it with the "energizer-impact-collision" system invented by B. C. Pole. Mr. Pole's plan, which was referred to in the REVIEW some weeks ago, contemplates using a primary battery to operate a two horse-power motor, and this motor is to "*energize*" a pair of fly-wheels into doing 30 horse-power work. Henry K. Willard, secretary of the Columbia Insurance Company, is one of the prominent incorporators.

The United States Lighting Company is preparing to add the Thomson-Houston alternating system of incandescent lighting to its present plant. This will enable it to extend its incandescent business beyond the districts reached by its Edison system, and give it much strength in maintaining the control of electric lighting in the District of Columbia which it now holds.

Frank Aldrich, the manager of the Volta Eclipse Electric Company, has gone to Europe to investigate the primary battery lighting business as carried on in that country, and to purchase a supply of batteries.

The Navy Department has contracted with the Thomson Welding Company to supply and erect welding plants for engineering work at the New York Navy Yard and for construction work at the Norfolk Yard.

President Plum, of the Military Telegraph Society, has called a special meeting to be held in Washington on the 19th of June. It is expected that Dealey and Emerick, of New York; Wilson, of Philadelphia; Lew. Weir, of Cincinnati; O'Brien, of Scranton, and other leading war operators will be in attendance.

The Express and Storage Warerooms of Geo. W. Knox, the transfer expressman, are being wired for ten auxiliary fire alarm boxes, similar to those recently placed in the White House. William H. Allen, the manager of the Postal Telegraph Company, is the secretary of the company which is doing the work. G. C. M.

Washington, D. C., June 13.

OUR CHICAGO LETTER.

The Merchandise Business of the Sprague Electric Equipment Company has been purchased by the Electric Merchandise Company, who have opened offices at No. 11 Adams street, opposite the Pullman building. The company will manufacture and sell appliances for station, car and line work irrespective of system, and will, at all times, carry a full line of supplies necessary for the equipment of electric light and power stations and electric railways. The company report that they have in process of manufacture many improved car fittings which will soon be placed on the market. The management has been placed in the hands of W. R. Mason, whose experience particularly fits him for the position. Such arrangements have been made with Eastern manufacturers, that in most cases goods can be purchased of this company at the same price as at the factory, thereby saving freight which is quite an item, in heavy goods especially.

Leonard & Izard are very busy equipping five electric railways, among which is the Cicero and Prosiso Road, of Chicago.

The Central Electric Company have just completed arrangements with the Butler Hard Rubber Company to handle their new product in hard rubber. They exhibit samples of this new material, showing that it can be easily turned and takes a beautiful finish. To all appearances this is one of the best articles of the kind ever placed on the market; at the same time it is sold at a lower price than anything so far before the public. This rubber is made in the usual forms of sheet, rod and tube, and a large demand is predicted for it. Since taking the agency of the Burnley dry battery, the sales have reached up into the thousands, and is in growing demand with companies and individuals who are looking for a dry battery of merit. Even in its new quarters the company seems crowded for room, and they report that the enormous demands for Okonite wire remains unabated. The popularity of Candee weatherproof wire is rapidly growing, and the company has just closed an order for 100 miles of the same.

Personal.—C. S. Rusling, the Kansas City representative of the Thomson-Houston Electric Company, paid this city a flying visit on Thursday.—M. E. Baird, of the Eddy Company, was a recent visitor in the city.—H. A. Skilton, manager of the Foreign Department of the Ball Electric Company, was a recent visitor at the western office of the REVIEW.

J. H. Reid, western manager of Mather Electric Company, reports the following sales: Broadway Theatre, Denver, Colo., 1,600 incandescent, 10 Easton arc lights; Windsor Hotel, Denver, Colo., 900 incandescent, 20 Easton arc lights; Eureka, Kansas, 500 incandescent; Thore Building, Kansas City, Mo., 400 incandescent; Waterworks Company, Denver, Colo., 200 incandescent and one 15 horse-power motor; Female College, Liberty, Mo., 200 incandescent; Western City, Iowa, 89 thirty-two candle-power street lights, 400 domestic and 500 commercial lights. D. B. D.

Chi ago, June 14.

OUR BOSTON LETTER.

The Tropical American Telephone Company, of this city, will resume dividends in July.

The Essick Printing Telegraph Apparatus was again successfully tested recently, this time over a wire between this city and Washington, D. C.

The National Telephone Manufacturing Company, of this city, have adopted a novel form of circular, patterned after the government postal card.

Mr. Eugene F. Phillips, president of the American Electrical Works, of Providence, R. I., has been elected a director of the City National Bank in that city.

The Chadwick Lead Company, one of Boston's most progressive and enterprising corporations, have purchased the Forest River Lead Works, at Salem, Mass.

The Winchendon, Mass., Electric Light Company's New Station is about finished. Orders are already in hand for nearly its entire capacity, *i. e.*, 30 arc and 650 incandescent lights.

The Shelton Gas and Electric Company, of Shelton, Conn., has decided to remove its electric light station to Birmingham, nearby, where better facilities will be afforded.

Mr. Herbert H. Eustis, the president of the Eastern Electric Cable Company, of this city, welcomed his mother and sisters to their home last week, after several years' sojourn in Europe.

The Duralite Manufacturing Company, of this city, is enjoying a very satisfactory patronage from the electrical trade. This company manufactures a fibrous material for various electrical purposes as a substitute for rubber.

Messrs. A. J. Wilkinson & Company, Nos. 180 to 188 Washington street, this city, are handling a variety of electrical goods, including supplies for amateur electricians, apparatus for electric gas lighting and complete outfits for bell-hangers.

Employers of Labor require protection, if the law is interpreted correctly. For instance, if an employé of an electric light station or power plant is injured, through the oversight or neglect of the superintendent or foreman, the company is held responsible for the damages. The Employers' Liability Assurance Corporation, No. 71 Kilby street, Boston, presents a meritorious plan for the protection of all who employ labor.

The Johnston Train Signal Company has closed the negotiations which have been pending for some time past with the authorities of Woburn, Mass., and will establish its manufacturing plant in that town at once.

Mr. R. T. White, of this city, starts this evening on a business trip to various points in New York, Pennsylvania and Virginia. For some time the manufactures of Mr. White have been attracting a good deal of attention and favorable criticism from several prominent street railroad officials. The White "Daisy Chair" and girder rail have already been adopted by quite a number of street railways.

The Russell Mast Arm Company, of Providence, R. I., is about to remove to a larger factory, where its manufacturing facilities is to be more than doubled. This will enable the company to promptly fill the rapidly increasing orders for the Russell mast arm. Treasurer and manager, John I. Drake, reports the business of his company as more active and satisfactory than at any time since its organization, less than two years ago.

The Gethins Gravity Battery.—A fact that is becoming almost generally recognized is that this battery is especially suited for fire alarm, police signal, burglar alarm and telegraph work. The battery is adapted also for use in telephone service wherever a gravity battery can be used. The battery has been in use for some time in a large number of New England cities and towns, and has given satisfaction wherever used. In Boston alone upward of 2,000 of these batteries are in daily use, including those at the fire alarm department and in the police signal service.

New Type of Motor.—The Thomson-Houston Motor Company has introduced in this city a new type of electric motor especially suited for the working of elevators. The new machine has been successfully applied to a large freight elevator at the iron and steel establishment of Messrs. Brown, McClure and Company, No. 69 Purchase street.

The electric motor is connected directly with the elevator machine by means of Evans friction belting, necessitating but a minimum space. The motor is reversible and series wound, has a capacity of 10 horse-power and a potential of 220 volts. The controlling devices are handy to the machine. The current rope of the elevator operates directly the lever arm of the double rheostat, then, by an ingenious device, the reversible switch is thrown as the lever arm passes from one side to the other. An automatic device operates the lever arm at the upper and lower ends of shaft, thus making the elevator perfectly safe at all times, whether in charge of some one or run alone. The elevator machine itself is of an entirely new pattern, and is said to be the first of the kind ever placed in Boston. The system of elevator machinery as described, is adaptable to freight elevators, and, with a few additions and improvements, would be applicable for passenger elevator purposes. The elevator operated at present by this method carries 4,000 pounds. By the descent of the elevator but little power is required, comparatively speaking. The amount of current used is measured by meter and power is supplied from a central electric power station in this city. By this means expense is entailed only when the elevator is in operation.

Electric Stocks.—Boston quotations at closing hour of the Exchange, Saturday, June 14, were as follows:

Thomson-Houston Electric Co	68.
" " " Preferred	93¼.
" " " Series C	17.
" " " Series D	8¼.
Thomson Electric Welding Co	230.
" European Welding Co	113.
Westinghouse Electric Co	39.
Fort Wayne Electric Co	139¼.
Lynn Gas and Electric Co	150.
Edison Phonograph Doll Co	3½.
Eastern Electric Cable Co	65.
" " preferred	51½.
Gethins Electrical Manufacturing Co	2⅞.
Union Electric Car Co	7.
Electrical Safety Co	5.
Western Union	85⅝
TELEPHONE:	
American Bell	238.
Erie	47¼.
New England	55.
Mexican	1.
Tropical American	1.25
National Tel. Mfg. Co. (acoustic)	.65

Boston, June 14, 1890. W. I. B.

PERSONAL.

Capt. E. L. Zalinski, of the Fifth Artillery, has been ordered to special duty at Washington.

Willard D. Stanley, of Bridgeport, accompanied by his father, H. Dwight Stanley, was a New York visitor last week, and made his headquarters at the Electric Club.

Mr. Geo. A. Redman, of Rochester, N. Y., one of the successful electric light central station men of the day, made his headquarters at the Electric Club a few days last week.

Mr. Jesse M. Smith, the prominent Detroit electrician, was a metropolitan visitor last week. Mr. Smith is a member of the Electric Club, which he made his headquarters while in town.

Vice-President and General Manager Sargent, of the New York & New Jersey Telephone Company, is spending the week in a Pennsylvania city. Some of Monsieur Sargent's bachelor friends are becoming slightly suspicious of these trips to the suburbs.

Mr. C. J. Kintner, patent attorney and electrical expert, 45 Broadway, continues in business for himself, his former partner, Dr. Leonard Paget, retiring. Mr. Kintner has been made electrical expert of the Aldrich building plant, 45 Broadway, and Mr. Aldrich has set apart a room for his laboratory, in which he will have both direct and alternating currents, where he will be prepared to make all manner of electrical tests.

Double Carbon Lamp.

ANOTHER DECISION IN FAVOR OF BRUSH.

We publish below a full verbatim copy of the decree of the Circuit Court of the United States for the Northern District of Illinois, granting to the Brush Electric Company, of Cleveland, an injunction against the Sperry Electric Company, covering the manufacture or use of double carbon lamps.

This makes the fourth decree the Brush Company has obtained on patent No. 219,208, the others being against the Fort Wayne Electric Light Company, the Nordyke & Marmon Company, of Indianapolis, and the Indianapolis Union Railway Company.

THE BRUSH ELECTRIC COMPANY }
vs.
THE SPERRY ELECTRIC COMPANY. }

This cause having been brought to a hearing upon the motion of the complainant upon the bill and affidavits for a preliminary injunction to restrain the defendants, the Sperry Electric Company, from infringing complainant's letters patent No. 219,208, granted to Charles F. Brush, September 2, 1879, and assigned to complainant, by making, using or selling double carbon lamps embodying the invention, or inventions of said patent, and having been argued by H. A. Seymour, for complainant, and F. W. Parker, for defendant, and the same having been duly considered, the Court finds as follows, to wit:

1. That the double carbon lamps manufactured by the defendants, the Sperry Electric Company, and produced before the Court, viz., one marked "Complainant's Exhibit —New Sperry Double Carbon Lamp," wherein the two pairs of carbons are independently actuated and adjusted and burned successively, the feeding carbon of one pair having a supplemental clamp or device whereby it may be manually latched up and retained, separated from its mate during the burning of the other pair, the latched-up carbon being then automatically released, and the arc established and maintained between the second pair of carbons until consumed—the other lamp, the construction of which is shown in Defendant's Drawings numbered 7 and 8, and wherein the two pairs of carbons are independently actuated and controlled, and burned successively, and in which the feeding carbon of the idle pair is required to be manually latched up, to insure such successive burning of the two pairs—each embody the invention of Charles F. Brush, as described in said letters patent No. 219,208, and specified in the first six claims thereof, and that the complainant is entitled to an injunction as prayed for, restraining the Defendant Company from manufacturing, selling or using either of such infringing lamps until the final hearing of this cause,

It is, therefore, ordered, adjudged and decreed, that the defendants, the Sperry Electric Company, its officers, agents, attorneys and employés, be, and they are hereby, enjoined until the final hearing of this cause, from directly or indirectly making, selling, offering for sale, or using any double carbon lamps, like or similar to those mentioned in the finding above set forth, or any arc electric lamps in which two or more pairs of carbons are independently adjusted and regulated, and are burned successively to secure the continuous burning of one pair of carbons prior to the establishment of the arc between the other pair, substantially as set forth and claimed in the first claim of letters patent No. 219,208, and also from making, using or selling any electric arc lamps containing the inventions set forth and claimed in the second, third, fourth, fifth and sixth claims, or any of said claims in said patent No. 219,208, this order and decree to take effect on and after July 3d, 1890.

W. Q. GRESHAM,
H. W. BLODGETT,
District Judge.

The Latest Kemmler News.

A press despatch from Albany states that the Westinghouse Electric Company will replevin the alternating current dynamos held by the State in order to prevent their use for the execution of murderers. A writ by which the company expects to repossess itself of their dynamos now in the State prisons at Auburn, Sing Sing and Dannemora, will be issued. The Westinghouse Company claims a proprietary interest in the dynamos even after it has sold them.

Warden Brush has received the electric chair and appliances to be placed in the death chamber in Sing Sing prison for the killing of criminals. The warden said that the new death chamber would not accommodate the criminals sentenced for execution at the rate they are being convicted in his district. There are four cells in the building, and they are filled. Slocum, Jugige, Wood and Trezza, now occupy the cells. He expects two more before the month is out. Should they be sent to the prison before any of the above are killed, he will have to put them in the main prison.

Telephonic News

⁂ Mr. H. L. Storke, generally known as the "Pooh-Bah" of the telephone business, as he holds so many responsible offices, has returned to the metropolis from a brief visit to the city of Chicago. Mr. Storke's many friends, who remember how seriously ill he was for a number of months last year, will be pleased to learn that he has completely regained his health.

⁂ The dismissal of the appeal in the case of the Hudson River Telephone Company *vs.* the Watervliet Turnpike Company, at Albany, does not by any means decide the case. The main issue—whether the telephone company or the turnpike company must change the electric system it uses—is pending before Isaac Lawson. The present decision is on a side issue.

⁂ Telephone users are depending more and more on this valuable instrument. We think the record of the calls from each telephone set will show a gradual increase. No one who is a constant user of the telephone appreciates its full value until it refuses to work on a busy day. The time is coming when these lapses on the part of the telephone will not have to be chronicled.

Telephone Officials.

At a meeting of the stockholders of the Erie Telephone Company, held in this city last week, President Levi Sprague of this city presiding, the following directors were re-elected by ballot: Abner S. Adams, Chase Adams, Charles J. Glidden, Francis Jewett, J. W. C. Pickering, Levi Sprague and Asa C. Russell, of Lowell. Wesley A. Gove, of East Boston; J. W. McKinnie, of Cleveland; James A. Weston, of Manchester; N. H. Harvey, A. Whiting, of Wilton, N. H. The directors organized by the choice of Levi Sprague, president; Charles J. Glidden, secretary and treasurer; J. P. McKinstry, general manager.

At the annual meeting of the Southwestern Telegraph and Telephone Company, the above officers were elected with the exception of McKinnie, and in addition John E. Hudson and Gen. Thomas Sherwin, as directors, they representing the interests of the American Bell Telephone Company.

The annual meetings of the Cleveland and Northwestern companies will be held in September.

If You Call You Must Pay the Telephone.

A nickel-in-the-slot telephone has been placed in the New Haven House, New Haven, Conn. It cannot be used unless a fee is paid. There are only two instruments of the kind in existence, the other being in Hartford. There are five slots in the machine for the reception of a nickel, ten-cent piece, quarter, half dollar and dollar, respectively. These amounts cover the rates charged for telephoning to various places in and out of the State. To use the telephone it is first necessary to call up the central, as on an ordinary telephone. The objective point is then asked for, and when this is reached the party who rings up is told to put the necessary fee in the slot. If a dime is dropped in, a bell of high tone rings. For 25 cents the tone becomes lower, and for half a dollar the sound is like that of the average door bell. The dollar sound is similar to that of a fire-alarm gong. The sound of the bell is the signal to go ahead and talk. The contrivance is the invention of William Gray, of Hartford. A company has been formed for the manufacture of the instruments.

A New Danger Signal.

Very satisfactory tests of a new railroad electric danger signal were made last week on the Baltimore and Ohio Railroad, near Washington. The device, which is to be operated by the Universal Electric Railway Signal Company, of Richmond, Va., consists of an electric circuit formed by a brush contact underneath the engine with an iron rod laid between the rails. With suitable batteries and telegraphic apparatus, the engineers of trains coming from the same or opposite directions within a mile or a mile and a half of each other, are notified of the proximity of their trains with unerring certainty by the ringing of an electric bell, and then as soon at this dangerous proximity is noted, telephonic communication through the rail and rod can at once be established, and the engineers, after stopping their trains, may talk with each other.

A Telegrapher's Deserved Promotion.

We are pleased to announce the promotion of Mr. O. W. Stager, of the Pennsylvania & Reading Railroad, from assistant transportation master to that of transportation master, with office in Philadelphia, vice A. J. Speese, resigned. Mr. Stager is one of our townsmen and his host of friends will be gratified to thus learn of his promotion, says the Reading *Times*. The Pennsylvania & Reading Railroad have shown by this appointment their appreciation of the careful and meritorious conduct of Mr. Stager in all the various positions he has so successfully filled for that company. Mr. Stager is a bright example of the ambitious, energetic, careful and hard working American spirit. He has surmounted difficulties that to many would have been impossible. He had no influence to secure him this position at the start, but everything he has attained has been by hard and efficient service. He commenced at the bottom of the ladder, as a messenger, and step by step, has he, by untiring care and watchfulness over the interests entrusted to him, mounted the ladder of progress and prosperity. He has successively filled the positions of messenger, operator, manager, superintendent of telegraph, assistant superintendent main line division, assistant transportation master, and now he is appointed to the high office of transportation master.

In each of the positions named, Mr. Stager proved himself a capable and efficient officer. As superintendent of telegraph, with office at Reading, he so successfully managed this office that it was raised from an expensive and defunct concern to a paying basis, and in a few years became a profitable adjunct to the Reading Railroad interests. Mr. Stager's success in the management received favorable notice and was much appreciated by the higher officials of the company, and they soon found him developing to such an extent that he was given a more important position in the management of the railroad service in Philadelphia, where the difficulties and perplexities of the receiving and transporting of the immensely increased traffic of recent years, had almost become an impossibility to handle with the same limited facilities that served the purpose for a number of years before. Mr. Stager was remarkably successful in its management, and saved many dollars in expense and loss of trade, for which the officers expressed their appreciation. This was soon followed by another promotion, and he is now at the top rank of the transportation department. Mr. Stager is possessed of such ability and tact that will mark his distinction to whatever positions he may be advanced.

Thought He Saw Everything.

A specialist was called to treat a lady who manifested so much interest in his surgical instruments that he explained their uses to her.

"This laryngoscope," said he, "is fitted with small mirrors and an electric light; the interior of your throat will be seen by me as clearly as the exterior; you would be surprised to know how far down we can see with an instrument of this kind."

The operation over, the lady appeared somewhat agitated.

"Poor girl!" said her sister, "it must have been very painful."

"Oh, no," whispered the lady; "but just as he fixed the instrument in place I remembered that I had a hole in my stocking."—*Chatter.*

Messrs. Haggie, of the Monkwearmouth Ropery, are about to make a steel wire rope nearly four miles in length for colliery haulage purposes. The rope will be 3¼ inches in circumference, and will weigh from 12 to 14 tons. Messrs. Haggie believe this will be the largest haulage rope in use. Its breaking strength will be about 30 tons.

Interior Conduit and Insulation Company.

This is a recently organized corporation which has entered the electrical field with very flattering prospects before it. The president of the company is Mr. Edward H. Johnson, whose name is so familiar in connection with the various Edison interests. Mr. Johnson is devoting his energy and push to the new corporation and has associated with him the following gentlemen: Sigmund Bergmann, vice-president; W. A. Willard, secretary and treasurer; John H. McClement, comptroller, and Edwin T. Greenfield, electrician.

The business is firmly established on a sound commercial basis, and its system and details have been and are being protected by patents, which will secure to the company practical immunity from competition.

This company is now the owner of Letters Patent of the United States, covering, fundamentally and in detail:

1. Methods and devices useful in protecting electrical wires by means of a cheap insulating, waterproof and heat resisting pipe or tube.
2. A special twin conductor employing a new principle effective of safety in electrical distribution.
3. Methods of distribution of interior circuits now universally accepted as the best practice in electric wiring for securing economy and uniformity of candle-power.
4. Methods of treating porous or fibrous materials to render them water and fireproof and to give them high insulating properties.
5. Methods of securing freedom from moisture, gases and other deleterious elements in underground conduits.

Other patents further protecting the company's new methods are being acquired from time to time as improvements are developed.

From a new prospectus just issued by this company, we take the following:

"It will be readily surmised that in distributing the hundreds of thousands of horse-power of electric energy requisite to perform all this work (made necessary by the rapid development in the field of electricity), the aggregate mileage of interior conducting wires employed must assume enormous proportions, and that, in consequence, the superficial area of inflammable property traversed by them must represent a risk area so great as to justify the expectation of daily recorded fires of more or less magnitude. That this anticipation is, as a matter of fact, not realized; and that electricity really originates so few destructive fires, is, in view of the newness of the industry and the necessarily imperfect training of the labor at command, but evidence that electricity possesses an extraordinary high factor of safety, far higher in fact than any other force with which we are familiar. To appreciate this we have only to imagine the results that would follow an equally sudden and vast expansion of the industry of steam or gas distribution at a like initial stage and with a like paucity of skilled labor. The peculiar property possessed by electricity which thus undoubtedly minimizes the chances of serious results is its celerity of action. Time is a requisite to ignition in the case of a great majority of inflammable materials; electrical action resulting from derangement is generally so instantaneous as to practically eliminate time, hence ignition becomes the exception rather than the rule. Were it otherwise the record of disastrous fires would be much augmented. Nevertheless, there are conditions of derangement under which the electrical action will afford this element of time, which may, in fact, permit of a prolonged presence of the consequent heat; when these conditions prevail, serious consequences generally ensue, to which fact is due that suspicion and prejudice which is the sole barrier to the general adoption of electricity for all purposes to which it is applicable. If all electrical action were made instantaneous and the comparatively innocent effects of such action were localized where they could be safeguarded, this prejudice would at once disappear, and the industrial world would recognize their command of an absolutely safe force equal to their every requirement. To the end that we may demonstrate intelligently that this is not only feasible but that it is an accomplished fact, we will review the art of insulation, and compare the past practice with the new method.

"Prior to the inauguration of what may be termed the new electric era, electricity was used almost solely for the purpose of transmitting intelligence; the telegraph, the telephone, the fire alarm, the various signaling systems and kindred applications, are examples of such use. In these industries the insulation of the wires has but one function, viz.: That of maintaining an effective service. If the insulation fails, the service fails; no other untoward result follows for the reason that the currents employed are so weak as to be incapable of developing any considerable degree of heat. With the inauguration of the new era involving new applications, as for example, electric lighting, electric motive power and kindred uses, employing electricity under high pressure and in vast quantity, there was imposed upon insulation an additional duty, viz.: That of protecting life and property. If herein the insulation fails, not only does the service fail, but life and property are at once seriously jeopardized. That this risk is not an imaginary one is abundantly attested by the numerous recorded accidents which have occurred during the past two or three years. That the remedy for these occurrences is not to be found in an improvement in the quality of insulation is equally well attested by the fact that, in spite of all the manifold so-called 'perfected insulations,' accidents continue to occur. As a matter of fact, the one branch of electrical science which has not advanced in line with the new demands is this safeguarding of property from contact with the always possible abnormal heat development in the wires. It has been assumed by some that inasmuch as electricity was inherently safer than other mediums of lighting, the element of danger was practically absent, and by others that the danger could be sufficiently avoided by improvement in the quality of the insulation; hence, the evolution of a host of 'improved insulations'; many of which doubtless possess great virtue, but, unfortunately, they all follow one principle, viz.: That of affixing the insulation to, or drawing it upon the wire itself. This is the fatal error. The logic of all the relating facts in the art is against such practice. Modern electrical service is nothing more or less than a service for the distribution of heat. True, economical considerations demand, and physical laws permit, that the conductors conveying this heat shall be so arranged and so proportioned as to remain cool and, therefore, safe while doing the calculated duty demanded of them. But the proportions and conditions thus pre-arranged and determined to secure safety are peculiarly liable to accidental derangement, thereby imposing a duty for which they were not calculated; in this event the conditions of safety are gone, and heat is at once developed in such proportion and in such place as the extent and the nature of the derangement may determine. It is apparent, therefore, that any system of insulation which aims to secure absolute protection must take cognizance of, and provide against, the effect of this always possible development of heat. Experience has demonstrated that the practice of affixing the insulation to the wires does not do this. All insulations which can be so affixed are of necessity compounded of oils, gums, or other flexible and adhesive materials, all of which are readily affected by heat. Vain efforts have been made to find a new elementary material, or to compound known materials which shall have the multifold property of high insulation, great resistance to heat, extreme flexibility and proof against acids, gas, etc. The great value to the art of an insulation possessing these naturally diverse qualities has been of late years so keenly appreciated, as to concentrate the inventive mind on the line of its pursuit, to the exclusion of any consideration of other methods of protecting the wires. This is the only explanation of the failure of the inventors to evolve a natural and effective solution of the problem. Necessity has been well said to be 'The Mother of Invention,' and it was by virtue of the necessities of himself and the numerous friends who depended upon him for advice in such matters, that Mr. Edward H. Johnson was led to suggest the total abandonment of the old practice, and the substitution therefor of an enclosing tube, separate from, but forming a channel for conducting wires, continuous throughout their every ramification, thus fully protecting every inch of wire and rendering it accessible for periodic inspection or renewal and by the same means absolutely confining within the safe limits of a non-inflammable channel the possible heat development. The practical efficiency of such a method scarcely needs to be supported by argument or demonstration. Its very simplicity appeals at once and alike to the intelligence of the expert and the layman. The elimination of the element of extreme flexibility as an essential requisite of insulation simplifies the problem, and permits of the employment of a variety of materials not at all available in the practice of affixing the insulation to the wires. Thus the door is opened and the inventor now comes forward to provide the requisite perfection of detail. In this respect the industry is extremely fortunate in the chance which has brought to its aid Mr. Edwin T. Greenfield, a man of wider experience in the old method and, therefore, more keenly appreciative of its weakness, than any man in this or any other country. To the thoroughness with which Mr. Greenfield has done and is doing

his work is due the already high perfection of the new method and the guarantee that it will at once afford superlatively the elements of safety, economy, durability and convenience. In further pursuance of the conditions of safety, Mr. Johnson has incorporated with the new system a special conductor upon which he has been at work for some years, the function of which is to convert conditions favorable to a prolonged heat presence into conditions of instantaneous action hereinbefore described as a factor of safety.

"This conductor is so constructed as to convert all defects which may develop in the wires, such, for illustration, as a break, a leak, an imperfect union or other faults common to all systems of energy distribution, into that one defect or fault which is peculiar to electrical distribution and which is technically known as a "short circuit." This is a fault which develops instantaneously an abnormal concentration of energy and, in consequence, effects the immediate destruction of the weakest link in the chain which supports the current. Much has been said and written of the device known as the 'safety fuse,' and rules and regulations enforcing its use are universal. It is introduced as a link in every electrical chain and is designedly made the weakest link therein —hence a 'short circuit' simply means the destruction or giving way of this link, thus insuring by the breaking of the chain the total and absolute cessation of the electric current previously supported thereby. This weak link is, of course, located within safe pockets where the somewhat violent results of its disruption are smothered or otherwise rendered abortive.

"Contrary, however, to popular belief, this device does not provide absolute protection. Its failure to do so arises from the fact that it is only affected by an overloading of the chain. It is, of course, apparent that a partial break, an imperfect union or a leakage of the current, may develop a sufficient degree of heat to effect the ignition of inflammable materials, and yet not sufficiently increase the current strength to overload and fuse the safety link. The object of the special conductor herein alluded to is to convert with absolute certainty all defects, whether a break, a leak or other fault, into a 'short circuit' and the consequent overloading and fusing of the safety link. The effect of a 'short circuit' is generally apparent at the point of its occurrence in the form of an instantaneous flash, hereinbefore alluded to as ineffective of much damage because of its brief duration. It is possible, however, to have present conditions of extreme inflammability, as, for instance, gases, inflammable powder, as in a flour mill, lace or other delicate fabrics, or even the insulation of the wires themselves.

"It, therefore, becomes a matter of considerable importance to safely localize even this flash, and it is obvious that the inclosing tube does this to perfection, in that every inch of the wire is completely encased within the safe confines of its fireproof interior.

"The Interior Conduit and Insulation Company now enters the field with this new method of insulation, and claims that it is able to effect, not partially and imperfectly, but completely and absolutely, that safety which is the one essential to the general adoption of electricity. That this claim is not unsupported is attested by the endorsement the system has already received by architects, electricians, fire underwriters, municipal and other authorities interested in the matter of safeguarding property, and the extraordinary rapidity with which it has been accepted by the public. In finding a solution of the problem of insulating and protecting wires for interior use, the equally vexed problem of protecting and insulating wires underground has also been solved, demonstrating that the problem of electrical distribution, whether interior, aerial or underground, is one and the same, and may all be comprehended in two words, viz.: Insulation and accessibility. The high insulation, low cost, great durability and flexible character of the company's safety tubes, suggested at once their fitness for forming ducts for underground conduits, whereupon a special size and weight of tube was made, and at the same time a system of laying and sealing them so as to completely exclude moisture, gases, etc., was thoroughly worked out. The system thus devised has met with high approval and prompt acceptance, and is being rapidly introduced throughout the country. It is confidently believed that the insulation of the tube itself, combined with the means employed to prevent access of moisture and gases, will sufficiently protect the conductors to enable the customary insulation employed on underground cables to be entirely dispensed with. This belief is so strong that large installations are now being made in which the wires are entirely devoid of insulation, other than that afforded by the tube itself. Whether this practice will be found generally satisfactory or not, it is certain that a comparatively light insulation will suffice, and that the costly and cumbersome insulations and lead sheathing heretofore employed will henceforth be wholly unnecessary. The great evil of condensation so destructive of all wire insulations, and which is at its maximum in metal conduits, is scarcely a factor in these insulating tubes. It is certainly reduced to a minimum, and is thus within the easy reach of the corrective means which are employed in conjunction with the system. The provision for protecting the conduits from moisture and gases, also prevents the accumulation of gases in the manholes, and consequently avoids the dangers of explosion which attend other systems. The absence of metal sheathing of any kind is an important advantage, as in all systems of electrical distribution which are partly aerial and partly underground, lightning is apt to reach the underground from the aerial wires, and is almost certain to pierce the insulation to get at the metal sheathing, for which it has a great affinity.

"As the length of cable sections which may be drawn into the ducts, and the consequent frequency of manholes in any conduit, is determined by the weight and size of the cables to be drawn in, it becomes a matter of considerable importance to eliminate from the cable all material other than the copper itself, thereby permitting less frequent manholes with a conductor of a given capacity, or the use of conductors of greater capacity with a like number of manholes, than is possible with cables employing thick insulations and heavy metallic sheathing. Furthermore, if a cable consists only of copper, its withdrawal and substitution by a larger one, does not result in its consignment to 'scrap,' as in the case of insulated cables. It is, in fact, just as valuable then as it was originally and may be at once employed in lighter service elsewhere; a fact which materially heightens the economic value of the insulated conduits.

"A feature of considerable value is the facility with which a conduit may be given individual ducts of various sizes, thus offering greater accommodations for single conductors and small cables than is possible to conduits in which ducts of uniform sizes only are employed."

Those Telegrams.

It does seem, says the "Woman About Town," in the *Evening Sun*, as if the telegraph companies might, with advantage, give to their operators or their managers, or to him who has charge of the delivery of telegrams, some kind of discretionary power as to the necessity of delivering certain messages at unholy hours of the night. To be sure, in many cases, no one can judge perfectly as to the importance of a message except the sender and the recipient, but there still are many instances where it must be perfectly patent to the transmitter of the telegram that it is not one to justify arousing from the "first sweet sleep of night" the person to whom it is sent.

"A few nights ago," said a man, recently, to the Woman, "I came home from my business utterly exhausted, and went to bed at 10 o'clock. Just at midnight I was awakened by a pealing pull at the bell. I rushed down and found a boy with a telegram. With some anxiety I tore it open. It was from my wife, who is at our country home, and it read: 'Send me five yards of black velvet ribbon, No. 9, at once.'

"'Maria,' I said, as I slowly climbed the stairs, 'I don't always take you for a fool, but in cases like this the telegraph company ought to do something to protect a man.'

"Well, I clambered back to bed and got to sleep again, only to be awakened at 2 by another awful solo on the bell. A second time I crawled down stairs; a second boy, with another telegram. I opened this one. Again my wife: 'Do go over to mother's and sleep to-night,' it said, 'I am sure you will sleep better.'

"'Maria,' I said again—then I stopped saying and only thought, and went back to my room and got once more to sleep. Now comes the unbelievable part of my story. At 3.30 I heard another awful peal. There were no servants in the house, so down I went again. Another boy with another message. 'Is Maria crazy beyond cure?' I asked, as I opened this last. But it wasn't Maria. The telegram was signed 'John Jones,' or somebody I never heard of, and was addressed to my neighbor next door, and read: 'Cora is sleeping quietly.'

"'Cora is sleeping quietly, is she?' I snorted, as I thrust the paper back at the boy. 'I'm delighted to know it, even if I have to be waked at 3.30 in the morning and for the third time in the night to be told about it. But I'm not 'sleeping quietly.' I intend to, though, and you may carry back word to your station that I have fastened a horse pistol at my front door so that the next tug at the bell will send it off.' And the next night I sent Maria a telegram with orders to deliver it at 2 A. M., saying: 'I am sleeping comfortably at your mother's.'"

The Economic Flux Bulb.

The accompanying illustration shows a device for containing and conveniently applying liquid flux for all kinds of soldering, manufactured by the Boston Woven Hose Company, 226 Devonshire street, Boston, Mass. It is made of rubber, and has a wick which can be always kept moist and ready for use, supplying the acid in any quantity desired. A gentle pressure of the bulb governs flow of the acid. The bulb is made of pliable yet durable rubber and cannot be easily broken, and will not spill the acid, thus making a saving in time, money

and material. It may be conveniently carried, and is indispensable in any trade or industry where the soldering of wire or other material is required; in fact, where used it has been found more convenient and economical than the *modus operandi* requiring the use of rosin. Those who have used the bulb pronounce it a boon to linemen, as it can be suspended in any position without danger of spilling its contents on the clothing. Its peculiar merits recommend it to manufacturers of electrical apparatus, especially for use when winding the armatures of dynamos or motors.

Western Telegraphers' Tournament.

At the Western Telegraphers' Tournament, held in the St. Louis Exposition Hall, on June 8, the first prize for readable speed was won by J. McAndrew, of the Postal Telegraph Company, with a record of 226 words; A. T. Ellis, Postal Telegraph Company, second, 224 words, and J. C. McIlwain, Western Union, third, 221 words.

For the highest speed, combined with the most perfect Morse, A. T. Ellis won first prize, sending 224 words. For women sending with highest readable speed, the first prize was taken by Miss Mollie Landrigan of the Postal, sending 206 words. For those in the telegraph service prior to 1865, sending the highest readable speed, the first prize was taken by C. E. Turner, with 199 words.

No Electricians Wanted.

A regular meeting of the Building Trades Council, of Allegheny County, was held last week at Pittsburgh.

The committee appointed at the last meeting to examine into the credentials from the Electrical Union reported that the union was composed of inside wire men and dynamo men, and that they could not be admitted until they became exclusive organizations of men who worked simply on buildings during their erection. A special meeting to consider the Constitution will be held this week.

TELEGRAPHIC

.... John B. Van Deusen, a young telegrapher, at Saratoga, N. Y., is said to have invented and applied for a patent for a self closing telegraph key, a device which has been much desired and sought for.

.... The executive committee of the Western Union Telegraph Company has recommended the regular quarterly dividend of 1¼ per cent. The statement for the quarter will show $1,700,000 net.

.... The regular semi-annual dividend of three per cent. on the preferred stock of the Eastern Electric Cable Company was declared last week, payable June 16. The business of this company is continually increasing.

.... The statement of the Western Union Telegraph Company for the quarter ending June 30, shows: Net earnings, $1,750,000; increase, $300,000. Surplus April 1, $9,590,916; increase, $1,193,718. Total, $11,340,916; increase, $1,493,718. Interest and sinking fund, $243,143; increase, $33,143. Balance, $11,097,773; increase, $1,360,575. Dividend, 1¼ per cent., $1,077,382. Surplus, $10,020,377; increase, $1,460,561.

.... The Western Union Telegraph Company and the Oregon Improvement Company on the one hand, and the Pacific Postal Telegraph Cable Company and the C. P. R. on the other hand, have been waging a lively battle as to which telegraph company should get the bonus that the Port Townsend, Ont., Chamber of Commerce was willing to give to the company that would extend its telegraph system into that city. The Pacific Postal Company offered to build from Olympia, 120 miles distant, over a new railway that is under construction, for $12,000 cash, the estimated cost of the line, agreeing to allow the subscribers to take their subscriptions out in two years in telegraphing. This proposition was accepted, and by September 1, Port Townsend will also be connected with Vancouver *via* Victoria, and will form the American terminus of the C. P. R. telegraph, whose extreme eastern end is Halifax, N. S., nearly 5,000 miles distant.

.... The suit which has been pending in the Circuit Court of the United States for the district of New Hampshire since October, 1887, wherein the city of Manchester was plaintiff, and the Western Union Telegraph Company defendant, has been settled by the parties by adjudgment, by agreement in favor of the city for $2,500, without costs, which judgment has been paid. The action was brought originally in the Supreme Court, of Hillsboro County, in February, 1887, and was removed by the telegraph company to the Federal Court. It seems that by reason of the falling of a telegraph pole across a highway in Manchester in September, 1884, Mrs. Eliza Sykes, of Hooksett, who was driving on the highway, was thrown from her wagon, which was overturned and broken, while the horse was thrown down and injured, and Mrs. Sykes received personal bodily injuries and rendered lame. In September, 1885, Mrs. Sykes brought suit against the city of Manchester, to recover compensation for her damages. The city notified the telegraph company to defend the suit, but the company took no steps toward the defence of the action. At the trial in March, 1886, the jury gave a verdict for the injured woman in the sum of $3,500 and the costs of court. The city paid this in full after a judgment had been ordered upon the verdict, and then brought suit to recover the amount so paid from the telegraph company.

A New Brontometer.

An improved brontometer which indicates "the instant of each lightning flash and the beginning and duration of a thunder clap," is on exhibition in London. In the interest of science, the New York *Sun* hopes that a few brontometers will be imported before the fall campaign begins in Michigan and Kansas.

* * The conduit system may be used on the West Side electric line in Kansas City. Storage batteries are also receiving consideration.

* * The Omaha Street Railway Company have abandoned their "cable" on the Hamey-Dodge street line and are converting it into an electric road. Having tried both, they conclude electric motors are cheaper and more desirable than cable propulsion. They are also changing their Farnam street horse line into an electric road.

* * The Westinghouse Electric Company calls a special meeting for July 8, to determine on increasing the capital stock. The circular states that the company began about May 1 to take orders for electric railway equipment, and in May took orders for upwards of $200,000, and in addition negotiations were well advanced for orders for four times that amount.

* * Electrical spectacles and eye-glasses are inventions recently announced by the *Jewelers' Weekly*. W. Friedlander, a Portland, Ore., jeweler, is the inventor. The device consists of copper and zinc adjustments to the temples of spectacles and to the nose pieces of eye glasses, whereby a small current of electricity is generated, materially assisted by the moisture of the skin. It is claimed that this current will strengthen the optic and other nerves.

* * Among Southern cities, Memphis, Tenn., is pushing steadily to the front rank. It is building a bridge across the Missisippi river which will make a great through route to the West, and is just starting in the electric railroad business. Memphis has lately started a new daily paper, *The Commercial*, which has its own wires to New York and Chicago, besides receiving innumerable specials from every town of importance in the adjoining States. It is edited by J. M. Keating, Esq., one of the most versatile and capable writers in the country.

* * One section of the Omaha Street Railway's lines extends from near Fort Omaha on the North to South Omaha, passing through the business center of Omaha, and is 8½ miles long, operated by Thomson-Houston single trolley one-wire system: power house about ½ of distance from North end. Feed-wire taps trolley wire about half-way between power house and South Omaha, once only. This road parallels main telephone routes 4¾ miles on same street, and no where in the whole distance are they more than one block away.

* * In a certain building devoted to small manufacturing interests, in Bridgeport, Conn., a 120 horse-power steam engine was used to generate power. This power was delivered in such small units and through such a multiplicity of shafting, that the engine indicated 60 horse-power when not a machine in the building was in operation, the engine simply turning the shafting. Mr. E. H. Cutler, of the Elektron Manufacturing Company, of Brooklyn, happened to be in Bridgeport and heard of this plant. He at once proceeded to sell the proprietor of the building 50 electric horse-power (Perrett make), to do the work formerly done by the 120 horse-power engine. Great is electric power.

Brooklyn Wants It.

At a meeting of the Brooklyn Board of Aldermen, held last week, the following communication was received from the Brooklyn City Railroad and referred to the railroad committee:

To the Honorable the Mayor and Common Council:

GENTLEMEN: In December last the Brooklyn City Railroad Company made application to your honorable board for your consent to use electric power on Third avenue, between Twenty-fourth street and city limits. Several hearings have been held on the question and in the meantime the company's opinion of this power has been so strengthened by the experience of others in various parts of the country that it prompted them to consider the advisability of substituting another application of a more extensive character. I now make application, on behalf of the Brooklyn City Railroad Company, for the consent of your honorable body to use electric power on all the lines of cars operated by this company. Yours respectfully,

DANIEL F. LEWIS, President.

The French Copper Syndicate.

The trial of the French copper syndicate men was finished on May 28. The operations of the syndicate were the charges upon which they were tried. Secretan, Laveissiere and Heutsch, were convicted, Secretan being sentenced to six months' imprisonment and to pay a fine of 10,000 francs. Laveissiere was sentenced to three months' imprisonment and to pay a 600 francs fine, while Heutsch got off by paying a fine of 600 francs. Joubert, the sons of Laveissiere and Leevyer, Arabel and Seloyer, were acquitted. The judges declared Secretan guilty of manipulations to effect a rise in copper and of paying fictitious dividends. Heutsch and Laveissiere were found guilty of the last named offence. The judges allowed that there were extenuating circumstances in the case.

The convicted men may appeal from their sentence, but the present state of affairs regarding financial matters would hardly render such a step advisable. The Panama Canal bondholders have petitioned the Chamber to bring to trial De Lesseps and his subordinates, and the recent discussion in the Chamber regarding the Credit Foncier have both embittered the public.

In comparison with the sentences of the projectors of the Union Nationale, Secretan and his associates escaped with remarkably light penalties. The defence set up by Secretan's lawyer was that patriotic motives had inspired his client. He wanted to make France independent of England in the matter of copper production. He argued further that Secretan did not make anything out of his speculation, which was only to be a profit to the Société des Métaux, in which Secretan was a leading light. The judges may have been lenient because Secretan gave up all his property, including his picture gallery and Millet's "L'Angelus," for the benefit of his creditors. Secretan admitted that he and his associates had paid fictitious dividends in order to keep up the price of shares in the copper mines in which they were interested.

Secretan's fall resulted from his trying to control the copper market of the world. An unlooked-for shrinkage in the demand for copper made his speculation a loss. Instead of selling out at a moderate figure, he tried to carry 80,000 tons of the metal. The money with which to do this was borrowed from his friend, M. Denfert Rocherau, director of the Comptoir d'Escompte. Upon learning that Secretan could not repay these loans, and that the Comptoir d'Escompte would be forced into liquidation, Rocherau committed suicide while riding in a carriage, by blowing out his brains.

Heutsch claims that he knew nothing of the transactons between Secretan and Rocherau; hence his light sentence.

A New Ventilating Fan.

The Central Electric Company, of Chicago, are exhibiting a very handsome ventilating fan, the product of the Globe Fan Company, of New York. The fan is entirely of metal,

VENTILATING FAN FOR USE WITH ELECTRIC POWER.

nicely nickeled, light, and ornamental in design, and especially adapted for use in residences, saloons, offices and stores. The fan is run in connection with a small motor and the Edison-Lalande battery, and the combination seems to exactly fill a demand that has long existed. The motor can, of course, be run by the current from an electric light circuit where this is obtainable, but for sick room and residence purposes, the battery furnishes the necessary power. The cut herewith illustrates the fan itself.

The Utica Belt Line Railway.

The Utica, N. Y., Belt Line Railway has recently been put in operation under the Thomson-Houston electric railway system, and is a fine piece of construction, which embraces more than a few conditions not found in ordinary electric railway construction work. The total length of the track is 20.37 miles, 15.84 miles single and 2.27 miles double tracks. Seven and eight-tenths miles of single track is located near the curb line, on which the single bracket suspension is used; on the remaining track cross suspension is employed, with one or two exceptions. There are 32 turnouts, aggregating 6,200 feet in length, 18 single and one double track curves, and eight steam railroad crossings. The maximum gradient is eight per cent, and occurs at a distance of about 1,500 feet from the power station, and extends a distance of about 300 feet. There is one curve with a 50 foot radius, which has a grade of five per cent. The power station is a handsome one story brick building, equipped with all modern conveniences and necessary minor apparatus for a first-class power plant. It is well built, finely lighted, and the arrangement of the apparatus is admirable. At present three 200 horse-power Armington & Sims compound condensing engines are in place, and a battery of four boilers for supplying the necessary steam. The station is admirably situated as far as coal and water supply is concerned, the water being obtained from a large canal on one side, while the coal is dumped from the steam railroad cars on the other side directly into the boiler room. Six 80 horse-power Thomson-Houston railway generators are now in daily use. The station switchboard, which contains the auxiliary electrical appliances, is very handsome and finely constructed throughout. The car equipment consists of 25 cars, each equipped with two 15 horse-power Thomson-Houston railway motors. The power station, and, in fact, the entire installation, reflects great credit upon the railway company, which from the start had a disposition to use only the best material and forms of construction. The successful operation of the road since its start has shown this to have been a wise plan.

VIEW OF THE ELECTRIC RAILWAY AT UTICA, N. Y.

The Central Electric Company has secured the general western agency for this fan, and already report several sales.

Another Fight.

If the reports afloat can be depended upon, there may be considerable trouble in electric lighting circles in this city, and the Municipal Electric Light Company may be put to a great deal of trouble and inconvenience in consequence. Mr. A. W. Dulton, agent for the Brush Company in this city, said: "We have notified the Municipal Company, of this city, and the Citizens' Company, of East St. Louis, that we will enter proceedings against them for infringing upon our lamp patents." The Brush Company, it will be remembered, gave the city a serious set-back on its city lighting by instituting proceedings against the Jenney Company, of Fort Wayne, which was at that time under contract to furnish the lamps and dynamos for the company having the city franchises for street lighting. Since that time the Brush Company has succeeded in shutting up the United States Company and the Sperry Company. The Brush Company sets up the claim that the double carbon lamp now used by the Municipal Company of this city is an infringement on their patents, and that the method of hanging the lamps on a continuous circuit is also an infringement, and are determined to fight the matter to the end.—*St. Louis Dispatch.*

Pillar of Flame on Broadway.

ESCAPING GAS DOES DAMAGE IN THE SUBWAYS.

A formidable blockade and thousands of dollars of damage were caused at Fulton street and Broadway by illuminating gas on June 12th. Early in the morning of that day, some laborers were working in an excavation in the street made by the Steam Heating Company for the purpose of remedying the difficulty caused by their steam pipes being too near the electric light subways on the east side of Broadway. Eight gas mains, belonging to two companies, the Consolidated Gas Company and the Mutual Gas Company, meet and cross at Fulton street and Broadway. In some unaccountable manner, the men at work in the Steam Heating Company's excavation caused a leak in one of the gas mains, and in another unaccountable manner set the gas afire. Two slight explosions occurred. The gas kept pouring into the hole to feed the flames, which increased in size.

The fire department was called but was of no avail in checking the fire. All day and far into the night the blaze continued, causing a great blockade in both Fulton Street and Broadway.

The flame could have been easily extinguished, but it might have broken out somewhere else where it could not be so easily controlled and it was not thought advisable to smother it.

The gas companies feared to shut off the supply from their mains because of danger of explosions or death from suffocation in buildings where there are open jets when they should turn it on again.

On the east side of Broadway, in close proximity to the blazing pit, was the subway which carried the electric light cables. In this subway the Mount Morris Electric Light Company had two cables, both in operation, and the United States Company had 18 cables, none in operation. All of these cables were burnt out, probably occasioning a loss of $70,000, to say nothing of the delay caused.

On the west side of Broadway is the telephone and telegraph subway.* So far as could be learned, the wires in this subway were uninjured, the telephones in the district working all right and no interruption being reported from the telegraph company.

During the afternoon, Mayor Grant put in an appearance at the subway hole, but his presence only seemed to make the flames burn the fiercer.

Some one, probably the city, will have a pretty bill to pay, as the electric light companies in New York are not the sort of people to take a $70,000 loss and say nothing. The city will doubtless be sued, and they in turn will probably try to fix upon the responsible parties and recover.

Working Railways by Electricity.

At the semi-annual convention of the American Society of Mechanical Engineers, in Cincinnati, recently, a paper on "Working Railways by Electricity" was read by W. E. Hall. The author claimed that the combination of electrical with mechanical engineering will bring about a revolution of affairs in the future, and then discussed the possibility of an electric motor coming to the front as the power for moving railway trains. He claimed that a very important gain would be made by concentration of the power at one point, by reducing the number of steam cylinders, and by the great economy on large stationary engines when compared with locomotives. He suggested placing the central stations 30 to 40 miles apart. The author evidently has considerable faith in the increased traction obtained in sending a current between wheel and rail. He points out that if electricity were used there would be no delay to trains from the necessity of taking water or coal, and that the expense of water tanks and stand pipes would be avoided. The dead weight of the tender could be dispensed with, and there would be no necessity of cleaning fires. Various other ills to which the locomotive is heir were also pointed out.

Automatic Wire Calculator.

An important problem to the practical wire man is the proportioning of the size of the wire necessary to be used, both in the interior of buildings and outside, to carry safely and economically the amount of current requisite for a given number of incandescent lamps.

In order to meet the demand for an automatic wire calculator, one that can be readily carried in a small space in the pocket, handled quickly and conveniently in most any position, and one which will make an infallible calculation, the E. S. Greeley & Company, of New York, have issued such a device, which consists of two disks of stiff cardboard, of unequal size, the smaller one

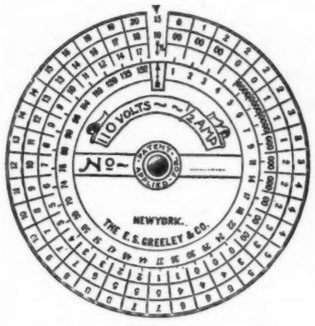


FIG. 1.—NORMAL POSITION.

being mounted in the center of the larger and made to revolve thereon. On the back of the larger cardboard are full directions for the use of this unique and useful tool. The one shown in our engravings is arranged for the calculation of wire for a current of 110 volts, and we understand that there is also another one in preparation, arranged for 55 volts.

The process of calculation is shown in the illustration, Fig. 1 showing the two disks in their normal position, and Fig. 2 showing the calculation determining the size of wire suitable for use to carry a current 5,000 lamp feet. The lamp feet are obtained by multiplying the foot distance by the number of lamps; that is, 50 lamps at 100 feet, or 10 lamps at 500 feet, or 500 lamps at

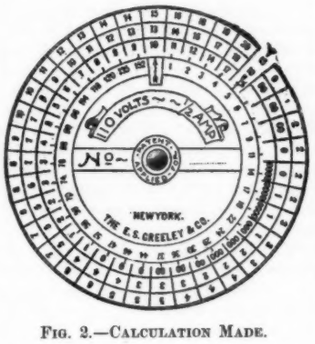


FIG. 2.—CALCULATION MADE.

10 feet, when multiplied one with the other, give 5,000 lamp feet. It is then only necessary to turn the inside dial until the figure 5 on the scale of the inside disk comes opposite the arrow which is upon the outside disk, which operation is shown in Fig. 2 of our illustrations. When this has been done the arrow upon the inside disk will point to the size of wire which it is desirable to use and which, in the accompanying illustration, is shown to be No. 10 for a 5 per cent. drop, No. 13 for a 10 per cent. drop, and No. 14 for a 15 per cent. drop.

This ready and accurate calculator can not fail to be of the greatest use to the practical wire man.

—— Three applications have been made to the Chicago Commissioner of Public Works for electric light companies and an electric railway in Hyde Park and Lake. Franchises were granted by the towns before annexation, but they have been referred to the law department and will have to await an opinion before they can be acted upon.

A Big Electric Light Station Struck by Lightning.

About 9 o'clock in the evening of June 10, the station of the Manhattan Electric Light Company, at Eightieth street and Avenue B, New York City, was set on fire by a bolt of lightning. The bolt struck the cupola on the building and came down onto a circular switchboard. A dynamo tender was oiling one of the machines, and turning round saw the circular board in flames, which quickly spread to the other switchboards in the dynamo room. Impressions of the lightning were only found on two wires after the fire.

These wires led to the dynamos which supplied current through underground circuits. The stroke was sufficient to make these machines "bleat."

Two alarms and a special call were sent out and in a short time the firemen had the flames extinguished. The building is fireproof, but the immense switchboards, completely covered with switches, etc., and the wooden partitions, are destroyed. Had the lightning come in over the wires, as has been stated in some of the daily papers, the lightning arresters would have protected both the building and the machines.

Besides other losses, the company has lost 18 incandescent dynamos and four arc machines, which were heated to a high temperature in the fire and then soaked with water. Not a single armature was burned out. The losses are fairly covered by insurance. The immense 3,800 horse-power steam plant is intact. There will be a loss on belting, however.

The night following the fire the company had in operation 10,000 incandescent lights and 320 arc lights. As they were well supplied with switches and other appliances, it will be but a very short time before everything will be running as smoothly as before the fire. Great credit is due Mr. Edward A. Leslie, the general manager, and his assistants, for the prompt way in which the wreck was cleared away and customers supplied with current.

The McLaughlin Storage Battery.

TO THE EDITOR OF ELECTRICAL REVIEW:

I note, in your issue of June 7, 1890, under head of correspondence from Philadelphia, the following:

"In the Northern part of the city, on Lehigh avenue, an experimental storage battery line is in operation. Two cars fitted with the McLaughlin batteries make regular trips. This is the only electric railway in the city."

I beg to correct the error into which your correspondent is led; and to that end, inform you that while a car (or cars) may be running on Lehigh avenue, they most certainly are not "fitted with the McLaughlin batteries."

My storage battery is no longer "experimental." It has passed far beyond that stage, and what it can do is no longer a matter of conjecture, but it is a fixed fact. I am not willing to shoulder the responsibility for any other system, whether on Lehigh avenue or elsewhere; hence, my desire to correct the statement.

Very truly yours,
JAMES F. MCLAUGHLIN.
Philadelphia, June 9, 1890.

A Deserved Recognition.

At a meeting of the Board of Directors of the Standard Underground Cable Company, Saturday of last week, Secretary J. W. Marsh was formally elected Assistant General Manager. Mr. Marsh is well known as an active and successful cable man, and his many friends will be glad to learn of this additional recognition of his services. He retains both titles. The business of the Standard Company has grown enormously, and the sales for the first five months of the current year have aggregated nearly $430,000.

It is expected that the new factories at Brinton, Pa., will be in operation on the first of November next. The present factories are running night and day.

—— The official report on the late Paris Exposition, which will consist of four volumes, shows the number of awards to American exhibitors to be 1,044.

ELECTRIC LIGHT NEWS

—— An electric light plant is to be installed at the Cincinnati Zoological Gardens.

—— It is probable that the Boston public buildings may be provided with isolated electric light plants.

—— Delaware, O., will celebrate the Fourth of July by turning the current on its electric lights for the first time.

—— Next week the Thomson-Houston Carbon Company commence the erection of another addition, 40x60 feet, to their Fremont, O., plant.

—— A saw-mill at Argenta, Ark., is to put in an electric light plant, so that the mill may be run day and night. The daily output will be 200,000 feet.

—— The new plant of the Long Branch Electric Light Company cost $100,000. The town will be lighted this Summer by 750 incandescent and 200 arc lights.

—— It is intended to light the town of Sofia, Bulgaria, with electricity, using the water of the Boyena as the origin of force. The cost of initial establishment is estimated at £20,000 to £24,000. Tenders will be invited in August.

—— A 50-light electric light dynamo has been placed on board the steam yacht "Sardinian" for the illumination of the saloon and the suite of rooms being fitted up for the voyage of the Duke and Duchess of Connaught across the Atlantic.

—— Mayor Barker has vetoed the resolution of the Providence, R. I., city council, granting to the Narragansett Electric Light Company a 25 years' franchise controlling the laying and maintaining of electrical subways in that city. The common council has sustained the veto by a unanimous vote.

—— In the language of an exchange, another town in the Lone Star State has pushed down the breastworks of barbarism and joined the procession in the progress of modern improvements, by introducing the electric light within its precincts. This time it is Cleburne, Tex., whose enterprising citizens have formed an electric light company and made a contract with the Westinghouse Electric Company for one of its 500-light alternating current machines. Go it, Texas!

—— William Wright, a resident of Morristown, N. J., has for the past few years been in the vicinity of Denver, Col., experimenting with electricity, and has been successful, it is claimed by a Western paper, in discovering a means by which electric currents can be more cheaply generated. The right to use the patent in the English provinces, we are also informed, has been sold to an English syndicate for $600,000. Mr. Wright and his wife have sailed for Europe, where he will receive the first payment of $175,000 upon arriving in London. We wish Mr. Wright well and shall be glad to hear more about his invention.

—— The Newark, N. J., Electric Light and Power Company has been compelled to make some important improvements and enlargements to the incandescent plant. This was necessitated by the great increase in the demand of the light made upon the company by its many customers. The corporation has been very successful in the establishment of the electric light plant, which has been on a paying basis from the very day it was organized. A good deal of this success, the company thinks, is due to the fact that it adopted the Westinghouse alternating current system of electric lighting. Apparatus of a capacity of 2,250 sixteen candle-power lamps was installed in the plant at first, and the last increase made the total capacity of alternating current machinery 3,750 lights.

ELECTRIC CLUBS.

PERSONAL MENTION—CLAM-BAKES—YACHTS, ETC.

New York Electric Club.

President Madden is expected to sail from Southampton for New York this week, arriving in New York about June 27th.

The "Crusader" is the name of the very handsome and complete yacht owned by Commodore Chas. A. Cheever, a prominent member of the Electric Club. These hot days, the privilege of spending a few days and nights on the water is a pleasure that can only be appreciated by those who experience it. The Commodore is a thorough yachtsman, and is never so happy as when entertaining, in his ever-generous manner, a party of friends on his floating beauty. The "Crusader" is a very fast boat, has a crew of 11, and under her owner's skillful sailing has carried off the honors in many races. Another yachtsman of the Electric Club is M. Roosevelt Schuyler, who is also a master of the art of sailing a vessel so as to get the best out of her.

Mr. E. T. Gilliland, the Club's popular ex-president, has returned from an extended visit in the West, much improved in health. For several months he was quite a sufferer, losing over 40 pounds in weight, but now is strong again and gradually regaining his usual health. This will be welcome news to his innumerable friends.

Mr. Eugene F. Phillips, a pioneer and popular member of the Club, gave a clam-bake on June 4th to his old friend, John I. Sabin, of San Francisco. The party set sail from Providence in a yacht, and landed at the Ponham Club House, on Narragansett Bay, near the well remembered Vue de l'Eau Club. Mr. Phillips is the prince of hosts and his pic-nic party was a great success. Among others who were present were the following: John I. Sabin, wife and daughter, of San Francisco; Col. J. N. Keller and wife, of Boston; Mayor Henry R. Barker, son and daughter, of Providence; F. E. Pettingell and wife, of Boston; T. B. Doolittle, of Bridgeport; P. C. Ackerman, of New York; W. H. Sawyer and wife, of Providence.

There is Talk of a Club dinner to be given early in July. A number of the New York members have expressed a desire to be present.

Chicago Electric Club.

For Some Time Past there has been considerable trouble with the restaurant service of the Club, and the matter was placed in the hands of the board of managers, who appointed committees to look into the matter. A special meeting was called for Monday evening, June 9th, the report of the committees read, and a general discussion held regarding the matter. After considering a number of schemes it was decided, on a motion made by the secretary, W. A. Kreidler, that the Club continue the restaurant service the same as in the past, which service was secured from Mr. Kinsley. The Club has always been noted for its excellent facilities for serving lunches, dinners and banquets, which have been found unexcelled by any other Electric Club in this country. The matter has been a very delicate one, and great credit is due the board of managers and their several committees in the manner in which the matter was straightened out, it giving good satisfaction to the members in general.

It was Decided at the meeting to give a banquet the latter part of this month in which the wives, daughters and lady friends of the members are expected to take part. The matter has been placed in the hands of the entertainment committee, which is composed of the following gentlemen: F. E. Degenhardt, chairman; W. J. Buckley, F. S. Terry, W. A. Kreidler and Alex. Kempt. The pleasant times had in the past at the Club dinners, entertainments and banquets, will give the members an inkling of what they may expect.

Boston Electric Club.

Mr. G. L. Wiley, of New York, manager of the Standard Underground Cable Company, was a guest at the Club on Thursday.

The Pool Tournament *finale* has been postponed until next September, when it is expected that the leading competitors for the three prizes offered by the Club will then come together and play off the unfinished games.

Messrs. Amiable B. Briggs, of Boston, and Goahead L. Wiley, of New York, crossed cues over the pool table last Thursday evening, and afforded considerable entertainment for a number of the Club members, particularly those who attended the "Cranks'" dinner. Mr. Wiley carried off the honors by winning seven consecutive games.

The Third Anniversary of the formation of the Club will be celebrated in an appropriate manner on Saturday, June 21st. It has been arranged that a trip be made to Marblehead Neck, Mass., where the members will partake of a fish dinner, and afterward participate in various athletic sports.

A DAILY NEWSPAPER'S IDEA OF NEW YORK SUBWAYS.

An Interesting and Important use of Electric Power.

The Mather Electric Company, of Manchester, Conn., have just closed, through their New England agents, Claflin & Kimball, of Boston, an important electric power contract, by means of which electric power is to be applied in a new manner to commercial use. The plant will be used to run a large part of the Cumberland and Presumpscot mills, belonging to the firm of S. D. Warren & Company, of this city. These mills, which are the largest paper mills in the world, are situated on the Presumpscot River, about four miles from Portland, Me. About a mile and a quarter above the mill there is a large water power belonging to the mills, which the firm have for a long time wished to utilize in some way at their mills, but up to the present time have been unable to do so as there seems to be no feasible way of transmitting the power, but by the contract just placed with the Mather Electric Company the problem has been solved. At the falls in the river will be placed the generating station, where there will be five generators, capable of delivering 80 horse-power each, thus having a combined capacity to deliver 400 horse-power; this power will then be carried to the mill, a mile and a quarter below, and there distributed throughout the mill, driving motors of 40 horse-power capacity each. The motors will drive isolated machines or lines of shafting, as the case may be, and as each motor can be stopped and started at will, it can easily be seen that the power can be used in the most convenient and economical way. In general these motors will have to run from six o'clock on Monday morning to six o'clock on Saturday night, night and day, without a stop. This is the most severe service that machinery can be put to, and shows the confidence that manufacturers are beginning to have in electrical machinery in general and in the apparatus of the Mather Electric Company's manufacture in particular. The contract was awarded to the Mather Electric Company after a long, and, it may well be imagined, sharp contest; the electric apparatus of all the large companies was carefully investigated by electrical engineers in the interest of Messrs. S. D. Warren & Company, and the award was made upon the very high reputation which the electrical goods manufactured by the Mather Electric Company has obtained among those who are capable of judging.

This plant will be the first of its kind in New England, if not in the country, and is the beginning of what will doubtless be a very large field for the application of electric power. By means of electric power thus applied, manufacturers can locate their mills at points on railroads or other places where most convenient, and can still have all the benefits of cheap water power; they can distribute their power as is most convenient in different parts of their mill building, and will entirely rid themselves of steam plants and their accompanying annoyances. By thus distributing their power around the mill, they will avoid long and heavy lines of shafting and save the power required to run them; they will also have their power under complete control at the point where the power is used, and will thus be able to economize their power to the greatest extent, starting or stopping a motor as the power is required for actual use.

Bury the Wires!

We reproduce on this page a cartoon which appeared in the New York *Evening World* on the evening of June 12th, the day of the conflagration at Fulton and Broadway. A short time ago, the cry of the New York daily press was, "Bury the wires! Bury the wires!" Now the wires are buried, except during the intervals when the illuminating gas tries to blow them back on to the poles. What is the attitude of the press? "Danger in the subways!" As we have before remarked, a subway in itself is a harmless animal, but when it gets to associating with "busted" water mains, leaky gas mains and worn out steam pipes, it loses its good character.

Electricity is King.

"This is very pretty, Rufus, but it ain't anything to what I've already seen."

The manager of Noah's Arc Light Company was depressed. He had shown an old country relative, Uncle Jake, all over his employer's splendid plant, but he had been unable to extract a murmur of surprise from him.

"Yes," continued the old man "we've got a man down our way that beats you all to pieces. You must know him—Prof. Moses Dittburner, of Runderhook, N. J.

The manager's lip curled instinctively. "I never heard of him," he replied, "the fellow must be some tyro."

"I guess he is," assented Uncle Jake. "And he is a dandy, too. His wife had the bad habit of taking money out of his clothes while he was asleep, but she don't any more. One morning she got up while her hubby was still peacefully slumbering and started in on her regular pocket examination. Just as she picked up his vest she heard a sort of groaning noise and a little organette commenced to play, 'I Owe Ten Dollars to O'Grady.' The professor had connected an electric wire with a music box in such a way that the latter would go off, and thus remind Mrs. Dittburner of her spouse's other and more pressing pecuniary obligations."

Uncle Jake reset his jaw after the above sentence and proceeded with:

"I'm a friend of the professor's, but he's got a splendid way of disposing of those he don't like. Particular chums of his are warned that when ascending the front stoop of Ditt's residence they must not bear their weight upon the second step from the bottom. Strangers, of course, don't know this, and as they toil up to the front door it amazes them to see a sign drop down with the words thereon, 'Not at home.'

"Mrs. Dittburner is something of a tyro herself," maundered Uncle Jake. "The professor is 45, but is still ranked as one of the boys. One evening, not long ago, he went to the lodge. On his return at 2 A.M. he walked boldly up the steps and inserted his latch key. Immediately he heard a crash and bang, and felt his hand electrically glued to the key. The entire house was lighted up as if by magic, and his wife came calmly down the front staircase. Slowly and deliberately she delivered a curtain lecture of two hours' duration and then turned off the current. If it hadn't been for this last act her husband would have been standing on the doorstep yet.

"On the next night out Mr. Dittburner took the key of the back door with him, but his wife was on the alert. While he was away Mrs. D. had secured a dog from the butcher, a great, ferocious beast, and she tied him in the kitchen near the door. Bruno ate two pounds of steak and a large Maltese cat, after which he went to sleep. He did not know that the part of the floor upon which he was lying had been prepared by the lady of the house. But it was so. Wires ran from it to the door, and by means of mechanism I can't explain, the simple opening of the door turned on the electric current and thus awoke the dog. Professor found it out, too, when he came back in the early morning. The dog was extremely mad about having his rest broken, and he started for Mr. Dittburner, intending to expostulate with him.

"Dittburner was spry, and immediately an exciting foot race commenced, the man jumping over chairs and tables, while the dog barked approvingly. At six o'clock, when the cook came down to manipulate the hash cutter, she found her employer perched on top of the boiler while the dog waited expectantly for him in the sink below."

"Why, Uncle Jake, I——"

"It's all right, Rufus, I know what I'm talking about. The professor was rather tired for some little time after that, but he soon originated a new scheme. He ran a wire beneath his wife's bed, and right under the mattress was a little button. When any extra pressure was brought to bear upon the couch a sign would appear over the door-plate bearing these words: 'She has turned in.' Then when the professor came home in the early morning hours he would consult this silent sentinel before he entered his abode. Often and often he would sit on the steps for hours, while his wife waited for him inside. It was a great scheme.

"But old Mrs. Van Buskirk spoiled it. Mrs. Van Buskirk always was a nuisance, anyway. She called on the professor's wife one day, and about the first thing she said was:

"'Oh, Mrs. Dittburner, what a funny house you have, and what queer ways you do indulge in.'

"'Why, what do you mean,' asked the hostess.

"'Nothing particular,' was the rejoinder, 'only as I came up the steps a little bell rang and a card dropped down that said, She has turned in. What does it mean?'

"Mrs. D. didn't explain, but she recollected that she had lain down for a nap just before old Mrs. Van came. So that evening she put the baby and two chairs to bed at 7.30 and waited behind the door for her husband. He came at 12 and there was music in the air.

"My friend is taking things easy just now," continued the old man, sadly. "His last invention rather soured his wife on electricity. You see, the professor contrived a machine by which you could drop clothes in a chute at the upper story of the house and they would fall down to the laundry, where they would be soaked, scrubbed and dried before you could say Dan McGinty. But little Johnny, the Dittburners' two-year-old son and heir, made a misstep the other day, went down the aperture and was partially scrubbed before his fond mother could rescue him. This, as I say, rather got her down on her husband's inventions. She says they may be all right, but she wouldn't have her children slaughtered, even in the interests of science. Well, by-by, Rufus, I'll bring the professor around some day and probably I can persuade him to give you a few pointers. You know, my boy, I want to do what I can for you," and Uncle Jake smiled sweetly, after which he departed on his return journey to Runderhook. —*Chicago Globe.*

KINDRED INTERESTS

A. G. Day has issued a new illustrated catalogue of the Kerite insulated wires and cables. A number of new tables relating to iron and copper wires make this book especially acceptable. The illustrations showing cable insulation are profuse and good.

Mr. E. S. Mendels, 45 Cortlandt street, general agent for the U. S. Electric Time Company, is in receipt of some very flattering testimonials from various people for whom he has installed the electric time plants of the above company. Mr. Mendels is also general manager of the Universal Arc Lamp Company, 49 West Twenty-second street, whose arc lamps are made for use on incandescent circuits.

The Elektron Manufacturing Company, of Brooklyn, are in constant receipt of flattering testimonials regarding the Perret motor. One man says his motor was immersed in a river for 10 days, and that after taking it out of the water and drying it, the insulation was as good and the motor ran as well as ever. The company have recently found it necessary to double the capacity of their plant. It is probable that they will be compelled to take the whole of the building in which they now have two large floors.

The Johnston Electric Train Signal Company have purchased a valuable property in Woburn, Mass., which they will occupy and utilize immediately as a factory. The building is four stories in height, has a frontage of about 100 feet, and is upward of 200 feet in length. It is located near the railroad, and its facilities are excellent. The company will set up its machinery at once, and it is expected that 100 mechanics will be at work within a month. The purpose of the concern is to manufacture not only the train signal, but push buttons of all descriptions and several electric hardware appliances.

The Lane & Bodley Company, Cincinnati, O., during the week ending June 6, received orders for one 500 horse-power high pressure Corliss engine for the Des Moines Electric Street Railway Company, Des Moines, Ia.; one 500 horse-power compound condensing engine, with surface condenser, for the Cincinnati Electric Light Company, Cincinnati, O.; and one 400 horse-power for the Evansville Gas and Electric Light Company, Evansville, Ind. These orders in one week show not only the demand for engines by electric light and power companies, but also a reputation for the old company, which has been in the business for more than half a century.

The Ball Engine Company, of Erie, Pa., have furnished engines for 36 different electric railways, aggregating 9,700 horse-power. Among orders recently received for engines are: Elgin Street Railway Co., Elgin, Ill., two 150 h. p. tandem compound; Johnstown Passenger Railway Co., Johnstown, Pa., three 150 h. p.; Winston Electric Railway Co., Winston, N. C., two 150 h. p.; Rockford Street Railway Co., Rockford, Ill., one 150 h. p. tandem compound; Binghamton Street Railway Co., Binghamton, N. Y., one 150 h. p.; South Side Land Improvement Co., Richmond, Va., one 100 h. p.; Rochester Street Railway Co., Rochester, N. Y., three 300 h. p. triple expansion, three 150 h. p. standard, one 60 h. p. standard; Belt Line Electric Railway Co., Port Townsend, Wash., one 300 h. p. double compound; Southern Railway Co., St. Louis, Mo., five 150 h. p. tandem compound.

Telephone Rights in South America.

It should be understood that no manufacturer or dealer in the United States, though he be licensed by the American Bell Telephone Company to make apparatus in the United States, has any right to export the same to South or Central America or the West Indies, unless authorized so to do by the Tropical American Telephone Company, who bought and own their export right direct from the inventors themselves.

Seattle, Wash.—The Seattle Electric Light Company has been reorganized, with a capital stock of $500,000. The new trustees of the company are: T. B. Tyndale, James A. McWiiliams, John A. McWilliams, J. M. Funk and J. H. McGraw. Another meeting will be held in a few days, when the officers of the new company will be elected.

EXTENSION of Dining Car Service on the PENNSYLVANIA LINES.

IN THESE DAYS of hurry and rapid transit the dining car has become an essential element of every through train. The Pennsylvania Railroad was the pioneer in the East of this branch of the service, and its dining cars have won a well-merited reputation among travelers. In order to better provide for the comfort of its through passengers, dining cars will, on and after June 16th, be added to the equipment of all through trains running over the lines ***west of Pittsburgh between the East and Cincinnati, Chicago and St. Louis.*** The principal trains on the lines East of Pittsburgh are now equipped with these cars, and their addition to those of the Western territory will greatly enhance the convenience of passengers destined to the three great Western termini.

"IN STOCK at San Francisco, for immediate delivery: One 50 horse-power and one 75 horse-power Ideal Engine. Write for catalogue and prices."

A. L. IDE & SON, Manufacturers,
SPRINGFIELD, ILLS.

CHARLES J. KINTNER,
(Late Principal Electrical Examiner U. S. Patent Office)
ELECTRICAL EXPERT,
Solicitor Domestic and Foreign Patents
AND
ELECTRICAL ENGINEER,
45 BROADWAY (Aldrich Court),
NEW YORK.

TREASURY DEPARTMENT, Washington, D. C., May 26, 1890. Sealed proposals will be received at this Department until two (2) o'clock, P. M., Friday, June 20, 1890, for wiring the new U. S. Court House and Post Office, Pittsburgh, Pa., for a system of electric lighting. All particulars necessary in the premises can be obtained upon application to the Custodian, Custom House, Pittsburgh, Pa. The right to reject any and all bids, and to waive defects, is reserved. Proposals should be addressed to the Secretary of the Treasury, and endorsed, "Proposals for wiring Court House and Post Office, Pittsburgh, Pa." Acceptance of proposal dependent upon appropriation by Congress.
W. WINDOM, Sec'y.

FOR SALE.—Complete plant—Two upright Manning Boilers, two Ball engines, one Fort Wayne Jenny dynamo 1,000 light, one Goubert heater, two Worthington pumps, switchboard and all accessories. The above have been in use a short time only and will be sold cheap for cash.
Address, "A. B. C.,"
Care ELECTRICAL REVIEW,
NEW YORK.

FOR SALE—An established Machine Shop. Complete in every detail. Tools all new and modern. Planer, Shaper, Lathes, Drill, Miller, Gear Cutter, etc. An opportunity seldom offered. Address, **"B,"**
Care ELECTRICAL REVIEW,
13 PARK ROW, NEW YORK.

ELECTRIC CONDENSERS WM. MARSHALL, MANUFACTURER. Standards a Specialty
Rooms 2 and 4, University Building, New York.

GETHINS
Improved Gravity Battery.

Especially Adapted for Closed Circuit Work.

The best Battery in the World for Fire Alarm, Burglar Alarm, Police Signal, Railway Signal, Telegraph Work of all kinds, and particularly well suited for Telephone Work wherever Gravity Batteries are used. Thousands of Batteries now in use in all parts of the United States, and Giving Perfect Satisfaction.

In the City of Boston alone over 2,000 are used in Fire Alarm and Police Signal Service.

Supt. Flanders writes as follows:
OFFICE OF SUPERINTENDENT OF FIRE ALARM TELEGRAPH,
CITY HALL, Boston, Feb. 6, 1890.
GENTLEMEN: In answer to your inquiry in regard to the merits of the Gethins Battery as applied to this service, I have to say that after three years of the most exacting work it has clearly demonstrated itself to be greatly superior to any closed circuit battery I have heretofore used. Given the proper attention it runs three times as long as the gravity, maintaining an even current, is more easily handled and much more economical in expenditure of material. I get from 10 months to a year of continuous service from them without rebuilding, which, as stated above, is at least three times as much as was given by the gravity.
Respectfully yours, B. S. FLANDERS, Supt.
By C. A. GEORGE, Asst.

Send for CIRCULAR and PRICE LIST to the Manufacturers,

The Gethins Electrical Mfg. Co.,
620 Atlantic Ave., Boston, Mass.

WASHINGTON CARDS OF INTEREST TO ELECTRICAL MEN.

The Columbia National Bank,
911 F STREET, N. W.,
WASHINGTON, D. C.
A General Banking Business Transacted.
CAPITAL, $250,000.
B. H. WARNER, *Prest.* A. T. BRITTON, *Vice-Prest.*
E. S. PARKER, *Cashier.*

THE
WASHINGTON LOAN AND TRUST CO.,
Temporary Offices, 1001 F Street, N. W.
LOANS MONEY on COLLATERAL and REAL ESTATE.
Pays Interest on Deposits. Has for sale Secured Investments.
CAPITAL, - - - - - $1,000,000
CALL AND SEE OR WRITE TO US.
B. H. WARNER, *Prest.* W. B. ROBISON, *Secretary.*
JNO. JOY EDSON, *V.-Prest.* W. B. GURLEY, *Act'g Treas.*

INVENTORS
Coming to Washington to further any electrical patents, will profit by calling on **C. W. Messner, of 1225 F St., N. W.** All the appliances necessary for tests, experiments, etc. Also, Electrical Contractor and Constructor. Special attention to isolated plants. Agent for the "C. & C." electric motor—sizes, ⅛ to 50 horse-power. The only electric motor on the market to-day.

Washington Electric Conduit Co.,
Room 36, Corcoran Building,
Washington, D. C.
Manufacturers and constructors of glazed Terra Cotta conduits for electric wires of all descriptions. Approved by the engineers of the District of Columbia and local companies. Can be examined by interested parties.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON JUNE 10, 1890.

429,596 Galvanic battery; John Beattie, Jr., Fall River, Mass.
429,599 Electric annunciator; James D. Bishop, Chicago, Ill., assignor to the Western Electric Company, same place.
429,606 Manufacture of incandescent electric lamps; Richard N. Dyer, New York, N. Y.
429,687 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Electric Car Company of America, same place.
429,703 Galvanic battery; Jose Siliceo, Jr., Mexico.
429,727 Lightning arrester; Oliver J. Lodge, Liverpool, County of Lancaster, England.
429,729 429,732 Generator for electrically reciprocated tools. 429,730 429,731 Electric drill system; Harry N. Marvin, Syracuse, N. Y.
429,735 Multiplex telegraphy; Francis J. Patten, New York, N. Y., assignor to J. M. Seymour, Brick Church, N. J.
429,736 Dynamo electric machine; Richard Pfund, Brooklyn, N. Y.
429,745 Electric connection. 429,746 Electric railway motor truck. 429,747 Telpher system. 429,981 Electrical railway conductor system; Chas. J. Van Depoele, Lynn, Mass.
429,751 Electric meter; John H. Barnard, Asheville, N. C.
429,767 Electric arc lamp; Carl Coerper, Ehrenfeld, Germany, assignor to Helios Actien-Gesellschaft fur Elektrisches Licht und Telegraphenbau, same place.
429,801 Telephone; Wm. Vogel, Chicago, Ill., assignor of three-fourths to Gary G. Calkins and Adolph Gray, same place.
429,815 Cable terminal; John C. Reilly, Brooklyn, N. Y.
429,817 Electric burglar alarm; Harold C. Shubert, Chicago, Ill., assignor to Louis K. Curlett and James Rose, same place.
429,825 Electric regulator; Edmund Wagemann, Little Rock, Ark., assignor of six-sevenths to John D. Adams, Dean Adams, Oscar Davis, John W. Davis, Horace G. Allis and John B. Jones, all of same place.
429,827 Graphophone; John H. White, Washington, D. C.
429,887 Galvanometer; Arthur E. Colgate, New York, N. Y., assignor to F. G. Otto & Sons, same place.
429,895 Galvanic battery. 429,896 Electrode for galvanic batteries. 429,897 Porous cell for galvanic batteries. 429,898 Solution for galvanic batteries; Geo. H. Felt, New York, N. Y., assignor to the Felt Electrical Company, same place.
429,912 429,913 429,914 Secondary battery; Carl Hering, Philadelphia, Pa.
429,946 Machine for turning dynamo commutators; Horace G. McLean, McPherson, Kans., assignor of one-third to Edward C. Heggelund.
429,982 Mechanical telegraph instrument; Eugene R. Waterhouse, St. Louis, Mo., assignor of one-half to Hart A. Fisher, same place.
430,010 Underground electric conduit; Henry Flad, St. Louis, Mo.
430,025 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut.
430,054 Switchboard; Johan M. Anderson, Boston, Mass., assignor of one-half to Albert Anderson, same place.
430,058 Method of separating ores magnetically; Clinton M. Ball, Troy, N. Y., and Sheldon Norton, Hokendauqua, Pa., assignors to the Magnetic Separator Company, Watervliet, N. Y.
430,060 System of electrical distribution; Edw. M. Bentley, Boston, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut.
430,066 Electric piano player; Joseph S. Case and Clark W. Evans, Plainfield, N. J.
430,075 Galvanic battery; Chas. A. Hitchcock, North East, assignor of one-half to Samuel A. Davenport, Erie, Pa.
430,076 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor by mesne assignments to the Thomson-Houston Electric Company, Boston, Mass.
430,094 Tool for turning dynamo commutators; Allen D. Spencer, Baltimore, Md., assignor of one-third to Richard M. Wallace, same place.
430,096 Automatic electric cut-out; Montgomery Waddell, New York, N. Y., assignor to the Waddell-Entz Electric Company, same place.

R. D. WILSON & CO.,
PROMOTERS AND DEALERS IN
Electric Securities
EXCLUSIVELY,
offer a limited number of shares of the treasury stock of the
NEW ENGLAND PRINTING TELEGRAPH COMPANY.
Capital, $1,500,000. Par Value, $50.
President, FRANK B. DOLE, Boston.
Directors:
Frank B. Dole, James P. Cook, Boston; Geo. W. Slade, Fall River; Abner McKinley, Canton, Ohio; P. S. Jennings, New York; John R. Reed, Westfield, Mass.
This Company is the licensee of the
Essick Printing Telegraph System
FOR THE NEW ENGLAND STATES.
The office of the Parent Company is at 171 Broadway, New York, where the system may be seen in operation on a line to Boston.
Correspondence solicited; further information furnished; and exhibition at
113 DEVONSHIRE STREET, Room 21, BOSTON.

Daniel W. Baker. Cyrus O. Baker, Jr.

BAKER & CO.,
Importers, Melters and Refiners of
PLATINUM,
408, 410, 412 and 414 N. J. R.R. Ave., NEWARK, N. J.
Platinum in sheet and wire, all sizes, and any degree of hardness. Scrap and native platinum purchased

Fuse Wire! Fuse Wire!
Accurately Determined. Carefully Made by a new Process. For Sale by
W. H. GORDON & CO.,
ELECTRIC LIGHT AND POWER SPECIALTIES,
Send for Catalogue. 115 BROADWAY, NEW YORK.

ELECTRICAL CONTRACT WORK.
Detailed Estimates Made and Contracts Taken for
Equipment of Complete Steam & Electrical Plants
of any system of Arc and Incandescent Lighting, Central Stations and Electric Street Railways operated Overhead, Underground or by Storage Batteries
—ADDRESS—
EUGENE T. LYNCH, Jr., Consulting Engineer,
120 Broadway, New York.

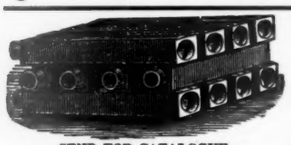
C. M. BLANCHARD.
ELECTRICAL CONTRACTOR & ENGINEER.
TELEPHONE CONNECTION.
Girard Building, Broad & Chestnut Sts.
PHILADELPHIA.

ELECTRICAL MEASUREMENT
Instruments and Batteries of the Very Highest Grade.
Precision and Constancy, Quality and Finish the Best in the World.
Catalogue of Standard Test Instruments furnished upon application.
THE E. S. GREELEY & CO.,
5 AND 7 DEY ST., NEW YORK.

W. R. OSTRANDER & CO.
195 & 197 FULTON ST., NEW YORK.
Manufacturers of
SPEAKING TUBES, WHISTLES, ANNUNCIATORS,
Electric & Mechanical Bells.
FACTORY,
De Kalb Avenue,
BROOKLYN.
Send for Illustrated Catalogue.

STANDARD ELECTRIC TEST INSTRUMENTS.
AMMETERS AND VOLTMETERS FOR DIRECT AND ALTERNATING CURRENTS.

QUEEN'S NEW
Portable Combination Testing Set,
WITH GALVANOMETER.
We pay special attention to recalibrating Ammeters and Voltmeters.
Send for Catalogue I-66 of Electric Test Instruments.
QUEEN & CO., — PHILADELPHIA.



SEND FOR CATALOGUE.

THE WYCKOFF PIPE CO.,
MANUFACTURERS OF
WOODEN PIPES FOR
UNDERGROUND ELECTRICAL WIRES.
We have large works for creosoting Lumber, R. R. Ties, Telegraph Poles, &c., &c.
WILLIAMSPORT, PENN.

F. M. RICKETTS COMPANY, Limited,
LAYERS AND REPAIRERS OF
Submarine Cables,
24 CORTLANDT and 19 DEY STREETS,
New York City.
J. A. SEELY, President. W. G. SELLERS, Gen. Manager.

SILKS. Full assortment of different sizes and qualities on **BRAIDER SPOOLS,** ready for the machines, in Red, Yellow and Green. Other colors to order. **Send for Sample and Prices.**
WM. MACFARLANE, & CO., 61 Grand Street, New York.
Telephone No. 971 Spring. Mill, Bergen Point, N. J.

THE CLARK
ARC LIGHTING SYSTEM
Is the Safest and Most Economical in the United States.
Manufactured by the CLARK ELECTRIC CO., 192 Broadway, N. Y.

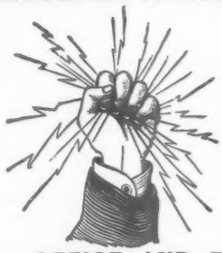
Horizontal DRILLING AND BORING MACHINE
Great Power.
WIDE RANGE OF
REVERSIBLE FEEDS.

SEND FOR PRICES & CIRCULARS TO
THE NEWARK MACHINE TOOL WORKS, Newark, N.J.

EUGENE F. PHILLIPS, PRESIDENT. W. H. SAWYER, SEC. & ELECTRICIAN.
AMERICAN ELECTRICAL WORKS,

Manufacturers of Patent Finished
ELECTRIC LIGHT WIRE,
MAGNET WIRE, OFFICE & ANNUNCIATOR WIRE,
RUBBER COVERED WIRE, LEAD ENCASED WIRE,
TELEPHONE & INCANDESCENT CORDS.
FARADAY CABLES.
Office and Factory, 67 STEWART STREET., PROVIDENCE, R. I.
New York Office, 10 Cortlandt St., P. C. Ackerman, Agt.

EUGENE F. PHILLIPS, PRESIDENT. JOHN CARROLL, SEC'Y-TREAS.
EUGENE F. PHILLIPS ELECTRICAL WORKS, LTD.



Manufacturers of
ELECTRIC LIGHT WIRE,
MAGNET WIRE, OFFICE & ANNUNCIATOR WIRE,
RUBBER COVERED WIRE, LEAD ENCASED WIRE,
TELEPHONE & INCANDESCENT CORDS.
FARADAY CABLES.
OFFICE AND FACTORY, St. Gabriel Locks, MONTREAL, CANADA.

PHŒNIX GLASS CO
OF PITTSBURGH, PA.
MANUFACTURERS OF A FULL LINE OF
ELECTRIC LIGHT
GLOBES **SHADES**
BOTH ARC AND INCANDESCENT.
RICH CUT, OPAL, CLEAR, ETCHED, ROUGHED, ETC.
ADAPTED TO ALL SYSTEMS.
729 BROADWAY, NEW YORK.
(COR. WAVERLY PLACE), AND
43 SIXTH AVE., PITTSBURGH, PA.

HIGHEST AWARD, PARIS EXPOSITION, 1889.

THE ONLY
Gold Medal
AWARDED FOR
Electric Batteries.

TRADE **GONDA** MARK.
The Standard Open Circuit Batteries of the World,
AND THE BEST.
THE LECLANCHÉ BATTERY CO.,
149 West 18th Street, New York.

THE ELEKTRON MANUFACTURING CO.,

79-81 WASHINGTON STREET, BROOKLYN, N. Y.,

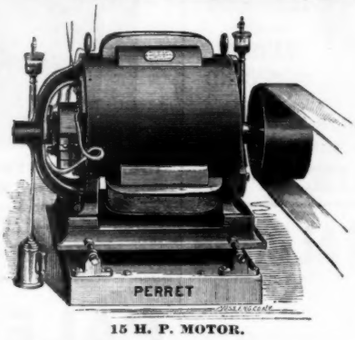
MANUFACTURERS OF

PERRET AUTOMATIC ELECTRIC MOTORS AND DYNAMOS.

EMBODYING LATEST IMPROVEMENTS

And all Desirable Features.

High Standard of Workmanship,
High Efficiency,
Low Speed, Perfect Regulation,
Simplicity.



15 H. P. MOTOR.

MOTORS
FOR RUNNING
Shops, Elevators and Machinery
OF ALL KINDS.

FAN OUTFITS
— FOR —
Battery or Electric Light Circuits.

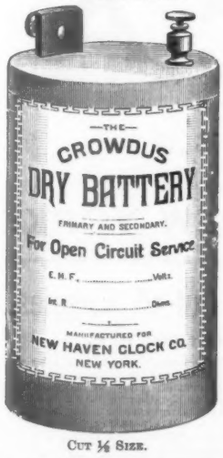
ISOLATED PLANTS for INCANDESCENT ELECTRIC LIGHTING.

NATIONAL ELECTRICAL MANUFACTURING COMPANY,

14 & 16 VESEY ST., NEW YORK CITY.

(Successors to the Electrical Department, New Haven Clock Co.)

No. 6x or Standard.



Cut ¼ Size.

If you want a Dry Battery use "THE CROWDUS." A gill of water is not necessary to operate it, not even a drop. Connect the wires and you have the same results as obtained for two cells of other makes. The testimonials which accompany our circulars say IT IS THE BEST.

Our 6x E. M. F. 2 Volts, Int. Resist., 0.25 ohms, - - - Price, $1.25
Our BABY E. M. F. 2 Volts, The smallest Battery ever made, a wonder to everyone, " .50
Our MEDICAL BATTERY, E. M. F. 4 Volts, - - - - " 2.00

Send for General Catalogue of Electrical Supplies, Telegraph Instruments, Bells, Wire, Annunciators, Etc. Illustrated in Colors. Free to any Address.

THE BUTLER HARD RUBBER CO.,

No. 33 MERCER STREET, NEW YORK,

Manufacturers of Hard Rubber Goods of Every Description Including the Celebrated

HARD RUBBER BATTERY CELLS

MANUFACTURED UNDER KIEL'S PATENTS FOR

STORAGE AND PRIMARY BATTERIES.

CHEAPEST AND BEST CELLS IN THE MARKET.

Also SHEET, ROD AND TUBING (Kiel's Patent), for ELECTRICAL PURPOSES at REDUCED PRICES. Standard quality Sheet, Rod, Tubing, Insulator Hooks, Key Knobs, Switch Handles, Telephone Receivers and Battery Syringes constantly on hand. Hard Rubber Specialties of all kinds made to order. Send for Prices and Estimates.

For Sale by CENTRAL ELECTRIC CO., CHICAGO, ILL.

DO YOU KNOW THAT YOU CAN HAVE YOUR OLD WIRES RE-COVERED

BY THE

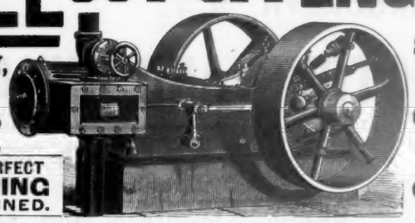
PATENT WOVEN PROCESS?

We make a specialty of re-covering old wires of any manufacture, putting on a covering, NOT BRAIDED, but WOVEN like canvas, and unequalled for tensile strength, abrasion and insulation resistance, and thoroughly fire-proof, at a saving of many dollars per mile. Protect your expensive rubber covered wires with a canvas jacket! We also manufacture the best line wire in the market, either solid or stranded. Write us for full particulars.

AMERICAN CIRCULAR LOOM CO.,

620 ATLANTIC AVENUE, - - - - BOSTON, MASS.

BALL AUTOMATIC CUT-OFF ENGINE



RELIABILITY,
ECONOMY,
SIMPLICITY,
DURABILITY.

THE MOST PERFECT GOVERNING EVER OBTAINED.

STANDARD
DOUBLE COMPOUND
TANDEM COMPOUND

For Electrical Lighting, Electrical Railways and purposes where perfect governing is required, it has no equal.

BALL ENGINE CO., ERIE, PA.

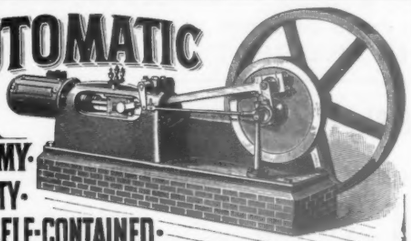
NEW ILLUSTRATED CATALOGUE NOW READY.

Contains a great variety of New Machines, and all the latest improvements on our regular manufactures.

MILLING MACHINES, SCREW MACHINES, ETC.

THE GARVIN MACHINE CO.,
Laight and Canal Sts., New York.

THE RICE AUTOMATIC



GUARANTEED ECONOMY
REGULATION · DURABILITY ·
SIMPLICITY · SELF-CONTAINED ·
8 TO 300 H.P.
PAIR & TANDEM · COMPOUNDS ·
THE JOHN T. NOYE MFG CO. BUFFALO. N.Y.

FAIRBANKS, MORSE & CO., Western Representatives, Chicago, St. Louis, Kansas City, Omaha, Denver, St. Paul
ALBERT FISHER, 89 Liberty Street, New York, Eastern Agent.

JARVIS ENGINEERING COMPANY,

CONTRACTING ENGINEERS for ERECTING COMPLETE STEAM PLANTS
For Electric Lighting and Power Stations.

—: AGENTS FOR :—
ARMINGTON & SIMS ENGINES,
JARVIS BOILER SETTING,
to burn Anthracite Coal and Coke Screenings,
NATIONAL FEED WATER HEATER,
NATIONAL ROCKING and SHEFFIELD GRATE BARS.

61 Oliver Street, Boston.

SEND FOR NEW CATALOGUE.

POND ENGINEERING CO.,

ENGINEERS AND CONTRACTORS.
Complete Steam Plants for Electric Light and Power.
Engines, Boilers, Furnaces, Grates, Heaters, Pumps, Injectors, Pipe Work, Belting, etc., designed with special reference to the HIGHEST EFFICIENCY.
Our Extended Experience Enables us to Guarantee Satisfaction. Send for New Illustrated Pamphlet.
ST. LOUIS, CHICAGO, KANSAS CITY AND OMAHA.

CHARLES R. VINCENT & CO.,

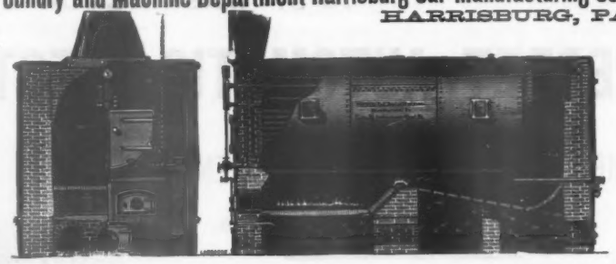
15 CORTLANDT STREET, NEW YORK,
Ball High Speed Automatic Cut-off Engines
MANNING VERTICAL TUBULAR BOILERS,
Complete Steam Plants Furnished and Erected.

WILLIAMS & POTTER,

15 CORTLANDT ST., NEW YORK.
Engineers & Contractors,
GENERAL AGENTS,
STRAIGHT LINE ENGINES

Weitmyer Patent Furnace,

MANUFACTURED AND SOLD BY
Foundry and Machine Department Harrisburg Car Manufacturing Co.
HARRISBURG, PA.



IDE AUTOMATIC ENGINE, PORTABLE & TRACTION ENGINES.
STEAM ROAD ROLLERS, BOILERS OF ALL DESCRIPTIONS.
New York Office, Messrs. Fleming & Kimball, 17 Dey Street.
New England Office, Messrs. John Post, Jr. & Co., 70 Kilby St., Boston.
Baltimore Office, Messrs. Thomas K. Carey & Bro., 26 Light St., Balt.
WESTERN OFFICE, MESSRS. ENGLISH, MORSE & CO., KANSAS CITY, MO.

PALERMO MICA CO.

MINERS OF

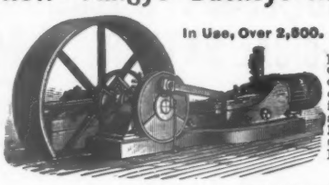
MICA

WAREHOUSE, 27 PECK SLIP,

THE ONLY COMPANY PRODUCING MICA IN THE UNITED STATES.

NEW YORK.

New Tangye Buckeye Automatic Cut-off Engines.



In Use, Over 2,500.

25 to 1,000 H. P.

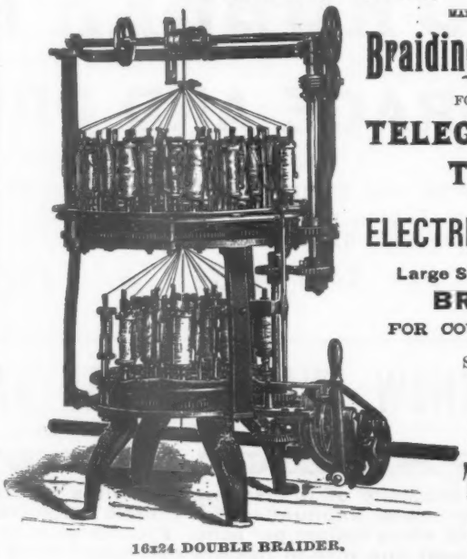
These engines are the combined result of long experience with automatic cut-off regulation, and most careful revision of all details. They are designed and constructed for heavy and continuous duty at medium or high rotative speeds. Highest attainable Economy in Steam Consumption and Superior regulation guaranteed. Self-contained Automatic Cut-off Engines 12 to 200 H. P. for driving Dynamo Machines a Specialty. Illustrated Circulars, with various data as to practical Steam Engine Construction and performance, free by mail.

Address BUCKEYE ENGINE CO., Salem, Ohio.

SALES AGENTS:
W. L. SIMPSON, 10 Telephone Building, 18 Cortlandt Street, N. Y.
N. W. ROBINSON, 154 Washington St., Chicago, Ill.
Robinson & Cary Company, St. Paul, Minn

NEW ENGLAND BUTT CO.,

PROVIDENCE, R. I., U. S. A.,



16x24 DOUBLE BRAIDER.

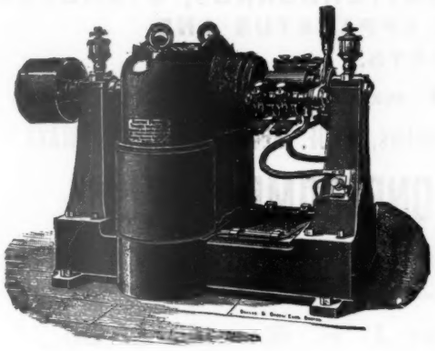
MANUFACTURERS OF
Braiding Machinery
FOR COVERING
TELEGRAPH,
TELEPHONE
AND
ELECTRIC LIGHT WIRE
Large Single and Double
BRAIDERS
FOR COVERING CABLES,
Single, Double and Triple
WINDERS,
Horizontal and Upright
Taping Machines
Cabling Machines,

Measuring Machines, Stranding Machines, Etc., Etc.
FINE CASTINGS A SPECIALTY.

THE

Thomson-Houston Electric Co.

MANUFACTURER OF



MOTORS

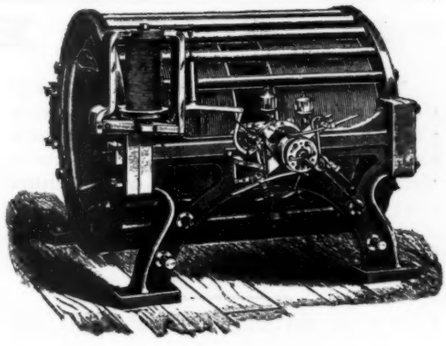
FOR THE

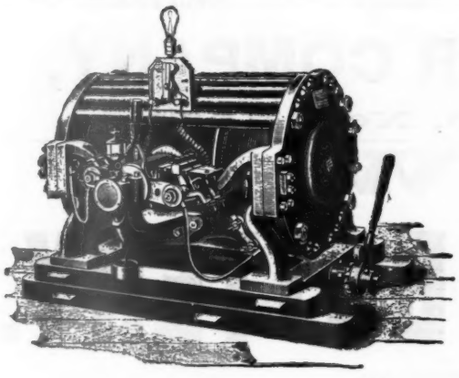
Electrical Transmission of Power.

DYNAMOS

FOR

ELECTRIC ARC LIGHTING.





DYNAMOS

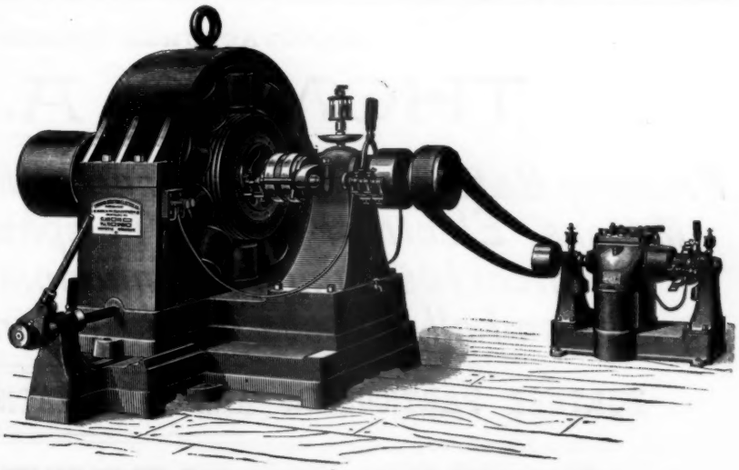
FOR

Direct Current Incandescent Lighting

DYNAMOS

FOR

Alternating Current Incandescent Lighting.

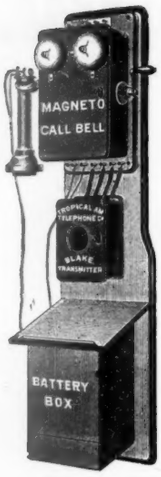


THE THOMSON-HOUSTON ELECTRIC COMPANY.

620 Atlantic Avenue, Boston, Mass.
Wall and Loyd Streets, Atlanta, Ga.
1110 Noble Street, Philadelphia, Pa.
215 West Fourth Street, Cincinnati, O.
503 Delaware Street, Kansas City, Mo.
148 Michigan Avenue, Chicago, Ill.
115 Broadway, New York City.
234 Montgomery Street, San Francisco, Cal.
403 & 405 Sibley Street, St. Paul, Minn.
1333 F Street, Washington, D. C.

TELEPHONES FOR EXPORT.

For South America, Central America and West Indies.



Genuine American Bell Telephones, Blake Transmitters and Magnetos.

"WILLIAMS" MAGNETO CALL BELLS AND SWITCHBOARDS, STANDARD STYLES. PATENTED TELEPHONIC APPARATUS AND SUPPLIES OF ALL SORTS.

Send for Reduced Price List and Catalogue.

All Export orders must be addressed to the Sole Assignee of the Inventors, PROF. BELL and FRANCIS BLAKE.

THE TROPICAL AMERICAN TELEPHONE COMPANY, Ltd.,

95 MILK ST., BOSTON, or 10 CORTLANDT ST., NEW YORK.

OR

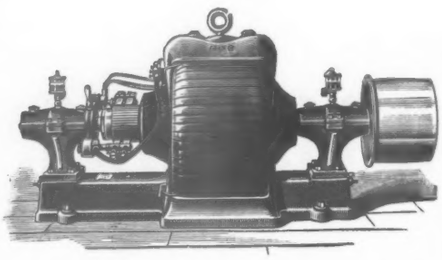
E. S. Greeley & Co., B. Blum & Co., or J. H. Bunnell & Co.

"C. & C." ELECTRIC MOTORS.

The only Motors in which the magnetic circuit forms a perfect circle around the centre of the armature shaft. Thus making the most compact and efficient form of machine that can possibly be devised.

One-eighth horse-power to 50 horse-power in stock.

OVER 8,000 MOTORS IN ACTUAL OPERATION.



FAN OUTFITS.

Electric Blowers for Ship Ventilation.

MOTORS FOR HOISTS AND MINING TRAMWAYS.

Equipment of Machine Shops, Printing Offices, Factories and Entire Buildings, with Electric Power.

New England Office, 63 Oliver Street, Boston.
Philadelphia " 38 South Fourth Street.
Chicago " Phenix Building.

"C. & C." ELECTRIC MOTOR COMPANY,

402 & 404 Greenwich Street, New York.

THE NEW

EDISON-LALANDE BATTERY.

MANUFACTURED UNDER AUTHORITY OF

THOMAS A. EDISON.

Primary Batteries for Telegraph "Mains" and "Locals," Electro-Motors, Electro-Plating, Telephone Transmitters, Electro-Medical Instruments, Annunciators and Burglar Alarms, and all Classes of Closed and Open Circuit Work.

FURTHER PARTICULARS AND INFORMATION FURNISHED UPON APPLICATION.

ADDRESS:

EDISON MANUFACTURING COMPANY,

JAMES F. KELLY, General Sales Agent,

19 Dey Street, New York.

Interior Conduit and Insulation Company.

A NEW DEPARTURE IN INSULATION.

THE OLD PRACTICE abandoned, because UNSAFE, UNRELIABLE, INACCESSIBLE and COSTLY.
THE NEW METHOD accepted instantly, because SAFE, RELIABLE, ALWAYS ACCESSIBLE and CHEAP.

A SIMPLE SOLUTION OF THE WIRING PROBLEM.

ELECTRIC Light Companies, Wiring Contractors, Architects, Builders, Insurance Inspectors and Owners,

TAKE NOTICE!

You have one and all been asking for a System of Wiring that would relieve you from the annoyance, discredit and cost of existing methods. Such a System is hereby presented to your attention, and you are invited to give it your careful consideration.

UNDERGROUND CONDUITS.

THIS Conduit has been adopted for UNDERGROUND WORK as promptly as for Interior wiring, with not less REVOLUTIONARY and SUCCESSFUL results.

Cheapness, High Insulation and Durability Afforded.
Total Abandonment of Costly, Cumbersome and Perishable Cables.
Your Investment is in Copper only.

THE INTERIOR CONDUIT AND INSULATION COMPANY are Manufacturers. Their Policy is to Deal only with the Trade, and to Sell on Commercial Discount Basis to all, without Restriction of any kind.

For Price List, Samples and General Information, address

INTERIOR CONDUIT AND INSULATION COMPANY,

16 & 18 BROAD STREET, NEW YORK. EDWARD H. JOHNSON, President.

GRIMSHAW WHITE CORE INSULATED WIRE

Grimshaw Patented White Core WIRES and CABLES.

FIRE, ACID, AND WATERPROOF. GRIMSHAW TAPE.

NEW YORK INSULATED WIRE Co.,

R. E. GALLAHER, Secretary. Sole Manufacturers,
J. W. GODFREY, Gen'l Manager.
W. B. DOWSE, Treasurer. 649 & 651 BROADWAY, N. Y.

THE

Horn, Brannen and Forsythe Manufacturing Co.

(INCORPORATED.)

Designers and Manufacturers of

Gas and Combination Fixtures,

AND

ELECTROLIERS,

427 to 433 North Broad St.

PHILADELPHIA.

CORRESPONDENCE SOLICITED.

THE

EMPIRE CITY ELECTRIC Co.

HELMET BRAND. WATER PROOF. WEATHER PROOF.

INSULATED WIRE.

Telegraph, Telephone and Electric Light WIRES AND CABLES.

HARDTMUTH EMPIRE CARBONS.

HARD AND SOFT CORED.

Mason Primary Batteries.

HOUSE WORK MATERIAL.

Batteries, Wire, Bells, Push-buttons, Flexible Cord, Burglar Alarms, Etc., Etc.

ELECTRIC LIGHT MATERIAL.

Poles, Cross-arms, Pins, Insulators, Brackets, Switches, Cut-outs, Lamps, Fixtures, Shades, Shade-holders, Etc., Etc.

ALL KINDS OF

ELECTRICAL SUPPLIES

Send for Wire Price-List and Catalogue to

The Empire City Electric Co., 15 Dey Street, N. Y.

OKONITE

TRADE MARK

Chicago, May 19th, 1890.

CENTRAL ELECTRIC CO.,

116 and 118 Franklin Street,

CHICAGO, ILLS.

Gentlemen :

Please furnish this company 1,000,000 feet No. 14 B. & S. Braided Okonite Wire.

CHICAGO EDISON COMPANY,

By CHAS. B. HOLMES, Purchasing Agent.

THAT'S WHAT TALKS!

DRAW YOUR OWN CONCLUSIONS!!

OKONITE

TRADE MARK.

WIRES, CABLES, TAPE AND CORD.

Look to us for Electrical Supplies of Every Description.

WE GUARANTEE PROMPT SHIPMENTS, LOW PRICES AND THE BEST OF GOODS.

SOUTHERN ELECTRICAL SUPPLY CO.,

823 LOCUST ST.,

Between Eighth and Ninth Streets, ST. LOUIS, MO.

WRITE FOR CATALOGUE.

INCANDESCENT

LAMPS

— AND —

All Kinds of Fittings.

FRANKLIN S. CARTER. CHAS. M. WILKINS. E. WARD WILKINS.

TRADING AS

PARTRICK & CARTER,

MANUFACTURERS OF AND DEALERS IN EVERY DESCRIPTION OF

ELECTRICAL SUPPLIES,

SOLE PROPRIETORS OF THE

New Patent Needle Annunciators and Burglar Alarms,

114 S. Second St., - Philadelphia, Pa.

ESTABLISHED 1867.

Catalogues and Discount Sheets will be sent to those in the trade upon receipt of application and business card.

SPECIAL AGENTS

FOR THE SALE OF

Partrick & Carter's Patent Needle Annunciators and Supplies.

UNITED EDISON MFG. CO., - - SAN FRANCISCO, CAL.
N. WEST. ELEC. SUPPLY & CONS. CO., - SEATTLE, WASH.
WOLFE ELECTRICAL CO., - - - OMAHA, NEB.
SOUTHERN DIST. TEL. & ELEC. CO., - BIRMINGHAM, ALA.

GIVES MORE POWER USING LESS WATER THAN ANY OTHER WHEEL.

THE OLD RELIABLE — LEFFEL — WATER WHEEL. SEND FOR CATALOGUE.

JAMES LEFFEL & CO. SPRINGFIELD, O., OR 110 LIBERTY ST., N.Y.

BROWNLEE & CO.

DETROIT, MICH.,

DEALERS IN

Poles, Cross Arms, Pins, Etc.

RED PINE OCTAGONAL POLES

for electric railways and electric lighting. Perfectly straight. The handsomest, strongest and most satisfactory pole in the market. 24 to 34 feet in length.

CEDAR TELEGRAPH POLES

of all sizes always in stock.

CROSS ARMS AND PINS

at lowest prices.

SEND FOR CIRCULARS.

CARBON PLATES & CARBON BATTERIES

ELECTRIC LIGHT CARBONS.

MADE FROM NATURAL GAS BY PATENTED PROCESS.

— ADDRESS —

SOLAR CARBON & MANUFACTURING CO.,

95 & 97 FIFTH AVE., PITTSBURGH, PA.

Shultz Belting Company,

MANUFACTURERS OF

SHULTZ PATENT FULLED LEATHER BELTING AND LACE LEATHER

Office and Factory: Cor. Bismarck and Barton Sts., St. Louis, Mo.

Our Belting is made of leather tanned on the surface only; the interior (which is the fiber and strength of the hide) is not tanned but rawhide fulled and softened by our patent process. Our Belting is more pliable, hugs the pulley better, transmits more power than any other, and is the only perfect ELECTRIC LIGHT BELT MADE. Agents in all cities. Send for trial belt.

DURABLE, EFFICIENT, ECONOMICAL, CONVENIENT.

For Stationary or Railway Work, for Mining or Engineering Operations, the Sprague Electric Motors are Unexcelled.

Sprague Stationary Motors are in use in more than One Hundred and Fifty Different Classes of Industries.

Address all Correspondence to the

SPRAGUE ELECTRIC RAILWAY AND MOTOR CO.,

16 AND 18 BROAD STREET, NEW YORK.

CONRAD N. JORDAN, President. E. COGORZA, Vice-Prest. & Treas. JAMES DUNNE, Secretary. J. R. BURDICK, Manager.

THE TRINIDAD-HEIMANN INSULATED WIRE CO.,

OFFICE, 49 LIBERTY STREET, NEW YORK. WORKS, HARRISON, N. J.

THE CELEBRATED TRINIDAD LINE WIRE. THE HEIMANN FIREPROOF INSULATED WIRE.

House Wire, Underground and Submarine Cables, and Solid System of Underground Wire, Manufactured by this Company.

LIST OF DYNAMOS IN STOCK.

Designation of Machine.	No. Lights 2,000 c. p. 10 amp. X	No. Lights 1,600 c. p. 8 amp. Y	No. Lights 1,200 c. p. 6 amp. Z	No. Lights 800 c. p. 4 amp.	Horse-Power at Pulley of Dynamo.	Width of Single Belt in inches.	Belt Speed Required.	Weight of Dynamo.
C	8	.....	.....	.....	6.5	1¼	5,000 FEET PER MINUTE.	530
C	.....	10	.....	.....	6.3	1½		530
C	.....	.....	.....	25	8.0	2		530
E	16	.....	.....	.....	12.0	2½		780
E	.....	20	.....	.....	12.5	2½		780
E	.....	.....	26	.....	13.0	2½		780
E	20	.....	.....	.....	15.0	3		990
E	.....	25	.....	.....	15.6	3		990
E	.....	.....	32	.....	15.0	3		990
F	.....	.....	.....	50	16.0	3		990
G	28	.....	.....	.....	21.0	4½		1,360

Ball Electric Light Co., 18 CORTLANDT ST. NEW YORK

LIST OF DYNAMOS IN STOCK.

Designation of Machine.	No. Lights 2,000 c. p. 10 amp. X	No. Lights 1,600 c. p. 8 amp. Y	No. Lights 1,200 c. p. 6 amp. Z	No. Lights 800 c. p. 4 amp.	Horse-Power at Pulley of Dynamo.	Width of Single Belt in inches.	Belt Speed Required.	Weight of Dynamo.
C	.....	35	.....	.....	21.0	4	5,000 FEET PER MINUTE.	1,360
C	.....	.....	45	.....	21.0	4		1,360
C	.....	.....	.....	70	21.0	4½		1,360
H	40	.....	.....	.....	29.7	6		1,750
H	.....	50	.....	.....	30.0	6		1,750
H	.....	.....	64	.....	29.5	6		1,750
J	52	.....	.....	.....	38.0	8		2,290
J	.....	65	.....	.....	38.6	8		2,290
J	.....	.....	83	.....	38.0	8		2,290
K	64	.....	.....	.....	46.5	10		2,770
K	.....	80	.....	.....	47.1	10		2,770
K	75	.....	.....	.....	52.5	12		3,300

THE BURTON ELECTRIC HEATER,

FOR ELECTRIC RAILWAY CARS.

No Smoke! No Gases! Economy in Space!

Normal use of Current, THREE AMPERES.

"They are giving us and the public entire satisfaction."—Richmond, Va., U. P. Ry. Co.
"The heat is pleasant, sufficient and economical."—Marlborough, Mass., Street Ry. Co.

FOR FURTHER INFORMATION, ADDRESS

THE BURTON ELECTRIC CO., RICHMOND, VA.

NATIONAL ELECTRIC LIGHT ASS'N. KANSAS CITY. C=E/R FEBRUARY. 1890.

SPECIAL NOTICE.

VOL. VII & VIII,

PROCEEDINGS OF THE

National Electric Light Ass'n Conventions.

Held at Niagara Falls and Kansas City,

Will be published in July (in book form, cloth bound).
It has been decided to accept a few pages of appropriate advertising.
This matter has been placed in charge of the

MAN'F'R'S ADVERTISING BUREAU,

BENJ. R. WESTERN, Proprietor. 111 LIBERTY ST., NEW YORK. Write for Particulars.

THE NATIONAL CARBON CO.

CLEVELAND, OHIO.

MANUFACTURERS OF

ELECTRIC LIGHT CARBONS AND BATTERY MATERIAL.

Porcelain Electrical Supplies and Specialties,

MANUFACTURED BY

EMPIRE CHINA WORKS,

144 & 156 Greene St., GREENPOINT, BROOKLYN, E. D., N. Y.

Our Ware is HARD PORCELAIN, the BODY and GLAZE IDENTICAL, and GUARANTEED NON-CONDUCTIVE for all ELECTRICAL PURPOSES.

SUBSCRIBE NOW FOR THE ELECTRICAL REVIEW.

WELLINGTON

Belt Holder

The simplest, cheapest and handiest device in existence for shifting Dynamo Belts. Please write for circulars to

W. R. SANTLEY & CO.
WELLINGTON, O.

Something New! One, two, three, and four spindle drills for light work.

DRILLS

The most useful patented improvement in drill presses for years is applied.

SENSITIVE

Spindles driven with single, endless belts. Large driving pulleys, tightener and variable speeds provided.

Over 1,000 in use. Buy the **latest** and **best.** Special machinery to order. Catalogue of fine tools free.

Dwight Slate Machine Co.

HARTFORD, CONN.

THE American Bell Telephone Company,

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30, 1877, No. 186,787.

The Transmission of Speech by all known forms of ELECTRIC SPEAKING TELEPHONES infringes the right secured to this Company by the above patents, and renders each individual user of telephones, not furnished by it or its licensees, responsible for such unlawful use, and all the consequences thereof and liable to suit therefor.

Dr. Gassner's Dry Battery

FOR

OPEN CIRCUIT WORK.

THE BATTERIES ARE NOW MADE IN THE FOLLOWING SIZES:

No.		Height.	Width.
18.	Rectangular (Double Cell),	7½ in.	3¾ in. x 3½ in.
17.	"	7½ "	3¾ " 1¾ "
16.	Cylindrical (Enameled)	7 "	3 in. diam.
15.	"	7 "	3 "
10.	"	5½ "	3 "
19.	Oval,	6½ "	3¾ in. x 1¾ in.
02.	Rectangular,	4½ "	2½ " 1½ "

A. SCHOVERLING,

Sole Agent and Manufacturer,

111 Chambers Street, NEW YORK.

THE

UNITED STATES ELECTRIC LIGHTING CO.

(WESTINGHOUSE ELECTRIC CO., Lessees.)

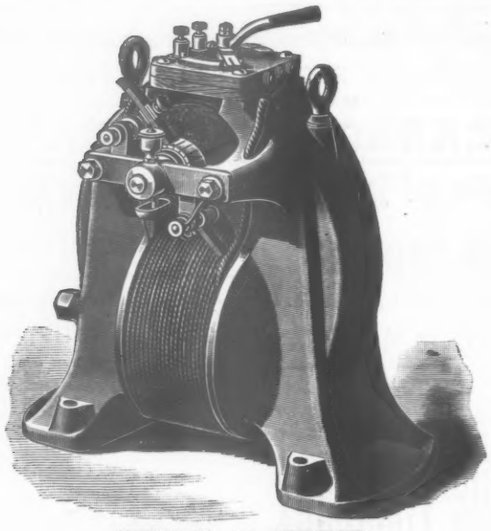
ARC AND INCANDESCENT

ISOLATED ELECTRIC LIGHT PLANTS.

AUTOMATIC DYNAMOS. PERFECT DEVICES.

More than 1,000 Plants in operation in Mills, Hotels, Office Buildings, Theatres, Etc.

ELECTRIC MOTORS and GENERATORS.



NEW U. S. MOTOR.

Direct Current Generators and Motors for all purposes. 1-8 horse-power up to any power desired, and of any required E. M. F. Superior in Design and Workmanship, and Unequalled in Efficiency.

Send for New U. S. Catalogue on Incandescent Lighting and Motors.

GENERAL OFFICES:

EQUITABLE BUILDING, 120 Broadway, N. Y.

EXCELSIOR ELECTRIC CO.,

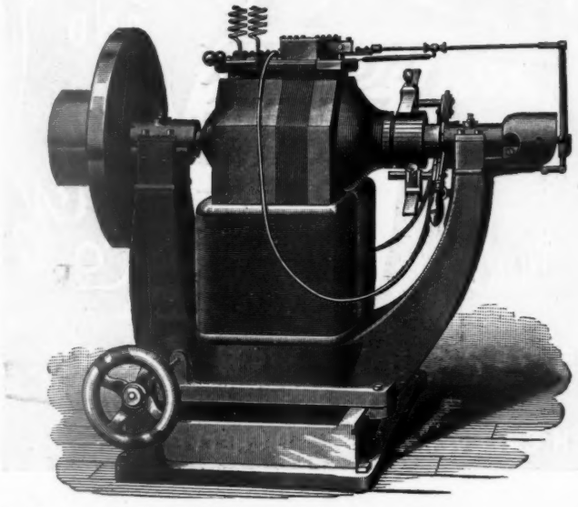
WILLIAM HOCHHAUSEN, ELECTRICIAN.

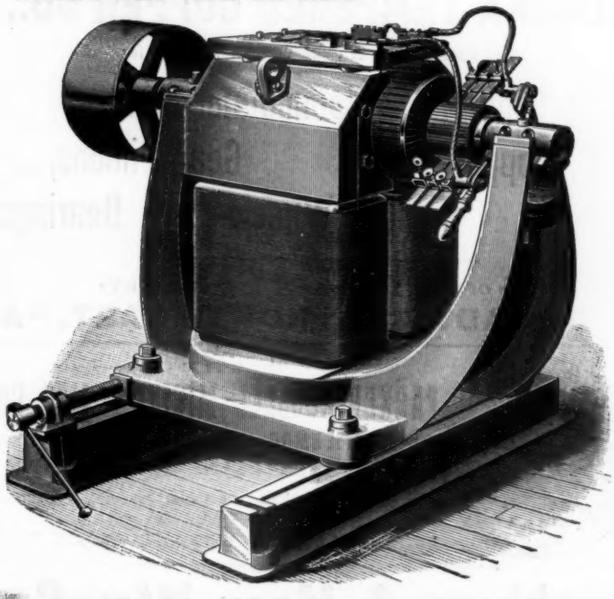
MOTORS

FOR ARC AND INCANDESCENT CIRCUITS.

WOUND FOR ANY CURRENT. PERFECT AUTOMATIC REGULATION

HIGHLY EFFICIENT AND ECONOMICAL. CONSTANT SPEED UNDER ALL LOADS.





Office, 115 BROADWAY, N. Y. Western Office, 425 THE ROOKERY, CHICAGO.

HOLMES, BOOTH & HAYDENS,

MANUFACTURERS OF

BARE AND INSULATED WIRE,

Underwriters' Copper Electric Light Line Wire, handsomely finished, highest conductivity. Copper Magnet Wire, Flexible Silk, Cotton and Worsted Cords for Incandescent Lighting. Round and Flat Copper Bars for Station Work. Insulated Iron Pressure Wire.

TRADE MARK "K.K."

PATENT "K. K." LINE WIRE

TRADE MARK "K.K."

For Electric Light, Electric Railways, Motors, Telegraph and Telephone Use.

Agents for the WASHINGTON CARBON CO.,

FACTORIES: WATERBURY, CONN.

NEW YORK OFFICE, 25 Park Place,

THOS. L. SCOVILL, NEW YORK AGENT.

UNITED ELECTRIC TRACTION COMPANY,

EXECUTIVE OFFICES, 115 BROADWAY, NEW YORK.

AGENCIES:

18 South 4th Street, Philadelphia. 111 Water Street, Pittsburgh, Pa. 455 Rookery Building, Chicago.

Electric Railways and Power Stations,

STATIONARY MOTORS, STORAGE BATTERIES.

DYNAMOS, 1 to 250 H. P. MOTORS, ½ to 100 H. P.

WORKS, JERSEY CITY, N. J.

WE are the exclusive Western Agents of WASHBURN & MOEN.

WESTERN ELECTRIC CO. - - - Chicago, Ill.

EUREKA TEMPERED COPPER CO.,

Only Manufacturers of PURE COPPER Tempered for

Brush Copper, Commutator Bars,
Copper Wire, Gear Pinions,
Trolley Wheels, Bearings.

EASTERN OFFICE: 35 BROADWAY. | FACTORY: NORTH EAST, PA.

SUNLIGHT CARBONS

THE PARKER-RUSSELL MINING & MFG. CO.
MERMOD-JACCARD BUILDING,
Cor. Broadway and Locust St. Rooms 307 and 308.
ST. LOUIS.

UNIFORM IN QUALITY, LONG LIFE AND GOOD LIGHT

Washburn & Moen Mfg. Co.

WORCESTER, MASS.

MAKERS OF
IRON AND STEEL
MANUFACTURERS OF
Iron and Copper Wire for Electrical Purposes.
PATENT GALVANIZED TELEGRAPH & TELEPHONE WIRE,
In Long Lengths, Galvanized by our Patent Continuous Process.

The Standard with all Telegraph and Telephone Companies.

Since the first introduction of the Electric Telegraph Service, our patent wire, expressly manufactured for electric purposes, has filled every requisition as regards strength, evenness of quality, and conductive capacity.
Send for Price Lists and descriptive pamphlets, and "Hand-book of Wire in Electric Service." Sent free on application.

New York Warehouse. 16 CLIFF STREET.
Chicago Warehouse, 107 & 109 LAKE ST.

NEW YORK BELTING AND PACKING CO.

LARGEST BELTS IN THE WORLD.

RUBBER BELTING, PACKING, HOSE,— —MATS, MATTING, STAIR-TREADS.

15 PARK ROW, NEW YORK.
(OPPOSITE ASTOR HOUSE.)
J. H. CHEEVER TREAS. J. D. CHEEVER DEP'Y. TREAS.

ROYCE & MAREAN,

DEALERS IN
ELECTRICAL APPARATUS,
Telegraph and Telephone Supplies,
No. 1408 Penna. Avenue,
Opp. Willard's Hotel. WASHINGTON, D. C.

SperryElectric Company,

Factory 195-207 Canal Street, Chicago, Ill.

MANUFACTURERS OF THE
Improved Sperry High and Low Tension Systems of Arc Lighting,
Claiming the Highest Efficiency, Reliability and Durability. Perfect Regulation.

Corliss Engines

Of the highest type, in all sizes, are made by
The Lane & Bodley Co.
CINCINNATI, O.

The merits of their engines are described in an illustrated pamphlet, which will be sent to any one interested.

THE GOODRICH HARD RUBBER CO.

AKRON, OHIO.
Manufacturers of
HARD RUBBER GOODS
FOR ELECTRICAL Purposes
SPECIALTIES OF ALL KINDS TO ORDER
SEND FOR CATALOGUE.

S. Y. L'HOMMEDIEU & CO., Eastern Agents, 65 Reade St., N. Y.

SOFT RUBBER GOODS

FOR ELECTRICAL PURPOSES
TUBING ALL SIZES
PURE RUBBER TAPE • FRICTION TAPE
Pure Sheet Rubber Etc.
Samples and prices upon application.
Address THE B. F. GOODRICH CO.
AKRON RUBBER WORKS
AKRON, OHIO.

S. Y. L'HOMMEDIEU & CO., Eastern Agents, 65 Reade St., N. Y.

FARADAY CARBON CO.,
ELECTRIC LIGHT CARBONS, PITTSBURGH, PA.

HAZAZER & STANLEY,

ELECTRICAL House Furnishings

32 & 34 Frankfort Street,

NEW YORK.

T. W. NESS, Montreal, - - - Agent for Canada.

EDISON

MINIATURE INCANDESCENT

ELECTRIC LAMPS.

1-2 to 36 Candle-Power. For use with Batteries or Dynamos.

8 to 40 VOLTS.

WE WILL SEND FREE, CATALOGUE E,

Which shows prices of, and experiments with Edison Lamps, and gives directions **how to make a Cheap Battery** to operate them. Any intelligent boy can make and use these batteries and lamps.

EDISON LAMP COMPANY, Harrison, N. J.

ELECTRICAL SAFETY COMPANY,

SOLE OWNERS OF

THE CARTWRIGHT ELECTRIC PROTECTOR.

—Is Simple in Construction and Unfailing in Action.—

A PROTECTION TO ALL ELECTRICAL INSTRUMENTS

Against destruction liable to occur by lightning or the crossing of a "live" electric light wire (poorly insulated or broken) with telegraph, telephone or other grounded circuits. Will also take care of instruments used on fire alarms and all metallic circuits.

At the Recent Test before the BOSTON FIRE UNDERWRITERS' UNION, the CARTWRIGHT PROTECTOR was the only instrument which successfully fulfilled all the requirements, and was approved of and accepted by the Board.

BOSTON BOARD OF FIRE UNDERWRITERS,
55 KILBY ST., Room 63,
BOSTON, April 21, 1890.

ELECTRICAL SAFETY COMPANY,
H. E. TOWNSEND, ESQ., Treasurer.

DEAR SIR: In reply to your favor of this date, permit me to say that the Cartwright Electrical Protector submitted by your company at the recent test of Electrical Safety Devices made by the Boston Fire Underwriters' Union is reported to us as having met in a satisfactory manner all the conditions of the test, and the use of the said Protector will be approved by our Inspectors. I am, yours truly,
(Signed) OSBORNE HOWES, JR., Secretary.

ELECTRICAL SAFETY COMPANY,

Room 21. *No. 146 FRANKLIN STREET, BOSTON, MASS.*

SEND FOR CIRCULAR.

PHOSPHOR-BRONZE

INGOTS, CASTINGS & MANUFACTURES.
THE PHOSPHOR BRONZE SMELTING CO. LIMITED
512 ARCH ST. PHILADELPHIA PA. U.S.A.
ORIGINAL MANUFACTURERS OF PHOSPHOR-BRONZE IN THE UNITED STATES AND OWNERS OF THE U.S. PATENTS.

W. L. SCOTT, President. J. F. PORTER, Vice-President. C. W. BRINK, Secretary.

St. Louis Electrical Supply Co.,

MANUFACTURERS' AGENTS AND DEALERS IN

ELECTRICAL MERCHANDISE OF EVERY DESCRIPTION,

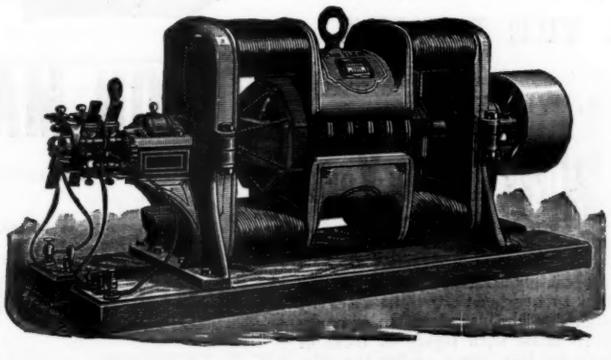
403 NORTH EIGHTH STREET,

WRITE FOR QUOTATIONS. **ST. LOUIS, MO.**

Buy The Schuyler Apparatus

IF YOU WANT THE BEST

ARC LIGHTING SYSTEM.



OFFICE AND FACTORY, MIDDLETOWN, CONN.

Western Office, Room 456, THE ROOKERY,

CHICAGO.

JOHN A. SEELY, President. JAMES A. TAYLOR, Treasurer and Secretary.

SEELY & TAYLOR MANUFACTURING CO.,

14 Cortlandt Street, New York City.

Seely's PATENT Copper Beveled Edge Sleeves AND Tee Connectors

USED FOR SPLICING AND BRANCHING FOR UNDERGROUND AND AERIAL CABLES AND HOUSE WIRING.

FIG. 1.

Fig. 1 represents Copper Tee used for branching from main cables, as shown in Fig. 2.

FIG. 2.

Fig. 3 represents a Copper Sleeve used for straight connections for continuation of cables.

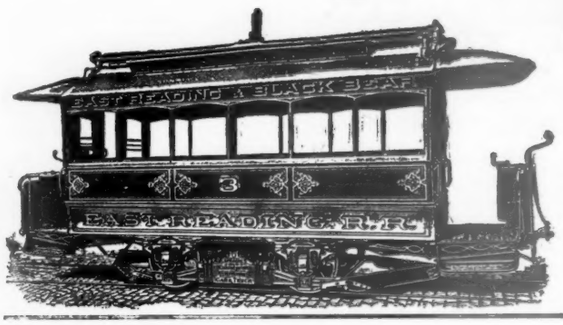
FIG. 3.

These sleeves are bevel edged, thereby preventing abrasion of insulation when placed over same.

THESE SLEEVES AND TEES ARE USED EXCLUSIVELY FOR ALL UNDERGROUND WORK IN NEW YORK CITY.

SEELY & TAYLOR MFG. CO., - - - 14 Cortlandt St., New York City.

WILL REMOVE MAY 1st to 24 CORTLANDT STREET and 19 DEY STREET.



JOHN STEPHENSON COMPANY

LIMITED,

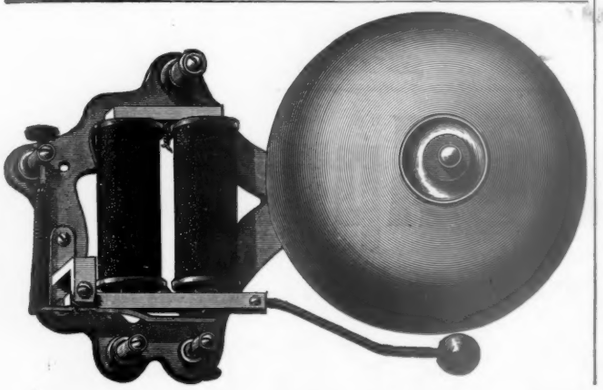
NEW YORK.

Street Cars

FOR

Electric Motors.

Manufacturers



H. E. & C. BAXTER,
18 Fulton Street, Brooklyn, E. D.

THE LEHIGH VALLEY
CREOSOTING CO.
WORKS, PERTH AMBOY, N. J.
Office, Foot of Washington Street, JERSEY CITY, N. J.
Creosoted Lumber, Underground Conduits, Telegraph Poles, Piling and Ties Furnished.

HYDRAULIC PRESSES.
ALL VARIETIES.
PUMPS, VALVES, GAUGES AND FITTINGS,
PUNCHES, SHEARS, BUFFING MACHINERY, &c.
WATSON & STILLMAN,
210 EAST 43D STREET, NEW YORK CITY.
Special Attention to Electrical Work.

THE E. S. GREELEY & CO.,

Nos. 5 & 7 Dey St., New York
Manufacturers and Importers of and Dealers in
Telegraph, Telephone
— AND —
Electric Light Supplies
AGENTS FOR
Cleveland Arc Light Cut Outs & Gang Switches
Cleats, Rosettes, Moulding, Pins, Cross-Arms, Brackets. Insulating Tapes.
Rubber, Porcelain and Glass Insulators
WIRES OF ALL KINDS.
Silk & Cotton Covered Flexible Conducting Cord of various sizes for Incandescent Lighting.
Spikes, Pole Steps, Lag Screws, Drive Screws. Turn Buckles. Etc.

EXTRACT FROM THE REPORT

— OF —

DR. SCHUYLER S. WHEELER,

— ON —

Underground Arc Light Wires in New York.

The line in 125th Street, 2,000 feet in length, is laid in the small ducts of the Johnstone system of conduits. The cable is a ***BISHOP GUTTA PERCHA WHITE CORE,*** and was laid immediately after the order for the work was given. The cable was connected to overhead arc light wires by running it up in a two-inch iron pipe fastened to the outside of an ordinary city electric lamp post. Connections were made with lights in front of stores by carrying the cable from the ducts in iron pipes under the sidewalk and up the front of the stores. This line has been in continuous use for two months, carrying a pressure of 2,500 volts, and it shows an actual rise in insulation with age and use, as will be seen from the following tests:

Jan. 11th, 1,100 Megohms.
Feb. 12th, 1,800 Megohms.
April 12th (including eight arc lamps and branch leads), 2,000 Megohms.

All our White Core India Rubber Insulation is Same Quality as on above cables.

BISHOP GUTTA PERCHA CO.,

420-426 EAST 25TH ST., NEW YORK.

EDISON MACHINE WORKS,

Schenectady, N. Y.

MANUFACTURERS OF

INSULATED WIRES, FLEXIBLE CORDS AND CABLES,

—FOR—

Telephone, Telegraph AND Electric Light.

JAMES F. KELLY.

GENERAL SALES AGENT,

19 Dey Street, New York.

VERITAS VINCIT. TRUTH TRIUMPHANT.

THE BROWN ELECTRIC PROTECTOR.

THE BEST AND CHEAPEST DEVICE BY WHICH TO

Protect Telephones and Telegraph Instruments.

TESTIMONIALS

BOSTON, MASS., April 24, 1890.

TO WHOM IT MAY CONCERN: This is to certify that my endorsement of the Crandell & Cartwright protectors was given by me prior to my knowledge of the Brown Electric Protector, which, when presented, was given the most severe tests such a device could be given, and fully demonstrated its absolute powers of control over dangerous currents of electricity. I have, since that test, which was given at the power station of the West End Railroad, Boston, Mass., on their Trolley system, given the Brown Protector many tests, both privately and publicly, and I unhesitatingly say that it is the most complete and effective electrical protector before the public to-day. Its simplicity of construction and its line connections recommend it to all, especially electrical people.

There are no fancy or difficult wire connections or weak electrical contacts, the obviation of which renders a device of this nature more positive and sure in its action, and not liable to get out of order, as is the case with other devices which were submitted to me for test.

This Protector, with the new Smith Automatic Auxiliary Cut-Out attachment, makes it the most perfect and absolute protector; and I recommend its use upon all grounded and metallic circuits, telephone, fire alarm, police signal, and such other kindred wires. The Brown protector is also a complete Lightning Arrester. This statement is made without fear or favor, and in justification of facts made apparent at the recent electrical tests given in this city under the auspices of the Boston Fire and Underwriters' Union, which I personally conducted, and at which numerous other devices were tested without satisfactory results. D. KILLECUTT,

Late Electrical Inspector of the Boston Fire Underwriters' Union.

BOSTON, April 21, 1890.

The Brown Safety Device has been submitted to a thorough test, and its efficiency demonstrated. WM. BROPHY, *Inspector New England Insurance Exchange.*

DEPARTMENT OF PUBLIC SAFETY, BUREAU OF ELECTRICITY.

MORRIS W. MEAD, *Supt. of Bureau.* RICHARD MCCLATCHEY, *Asst. Supt.*

PITTSBURGH, PA., May 24, 1890.

WM. H. SMITH, ESQ., *Gen'l Manager Brown Electric Protector Co., of New England.*

DEAR SIR: I have carefully examined the improvement which the Brown Electric Protector Company have lately added to their protector, and which applies especially to metallic circuits.

Upon trial it proves to be of great value. The essential idea being in cases of metallic circuits, especially those in Fire Alarm and Police Telegraph Service, to throw the current to ground both sides of the point wherever line may have been burned by coming in contact with wires carrying dangerous currents, thus automatically closing the circuit through the earth until permanent repairs can be made, and still leaving boxes operative both sides of the break.

This is a valuable feature for city service on all metallic circuits, and can be highly recommended.

This instrument is thus a protector for both grounded and metallic circuits.

Very respectfully,

MORRIS W. MEAD, *Supt.*

BROWN ELECTRIC PROTECTOR COMPANY,

NO. 54 DEVONSHIRE ST., BOSTON, MASS.

H. S. WINSTON, President. ERNEST HOEFER, Manager. ERNEST L. CLARK, Secretary.

ELECTRIC LIGHT And POWER SUPPLIES.

ILLINOIS ELECTRIC MATERIAL CO., POLES.

341 Rookery Building, CHICAGO.

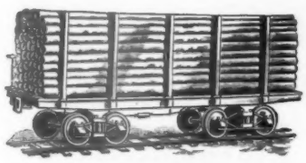
Trinidad Weather-Proof Wire, The only Moisture-Proof Wire in the Market.

GIVE US A TRIAL.

Bishop White Core Wires, Best Rubber Covered Wires in the Market.

STEVENS & BABCOCK,

EAST SAGINAW, MICH.



CEDAR POLES

— FOR —

ELECTRICAL PURPOSES

A SPECIALTY.

ASK FOR PRICES.

Delivered any part of the United States.

THACKARA MANUFACTURING CO.,

DESIGNERS AND MAKERS OF

GAS, ELECTRIC AND COMBINATION FIXTURES

For any Incandescent System.

Philadelphia, Pa.

THE EDDY ELECTRIC M'F'G CO.

MANUFACTURERS OF

AUTOMATIC ELECTRIC MOTORS,

In all sizes, from 1-2 H. P. upward; High Efficiency; Perfect Regulation; Superior Workmanship; Ease of Management; Remarkable Simplicity, etc., etc.

DYNAMO ELECTRIC MACHINES,

For Electro-Plating, Electrotyping, Copper Refining, Etc. No Reversing. No Water. No Noise. No Spark.

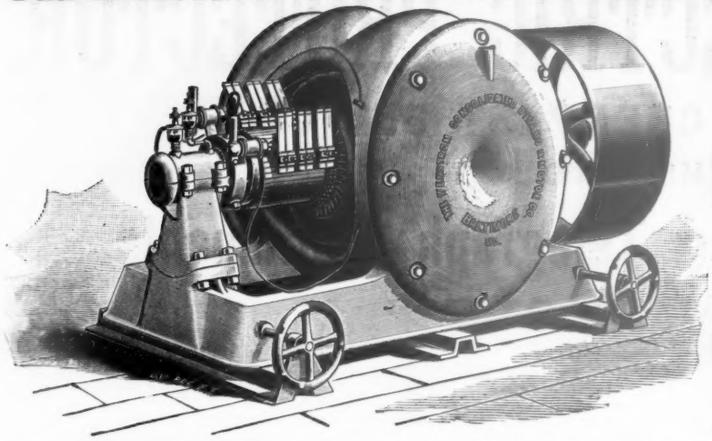
SATISFACTION GUARANTEED.

THE EDDY ELECTRIC M'F'G CO., WINDSOR, CONN.

NEW YORK, 33 Church St., BOSTON, 111 Arch St., PHILADELPHIA, 506 Commerce St., CHICAGO, 329 Rookery Building. KANSAS CITY, Rialto Building, NEW ORLEANS, 101 Camp St.

THE WENSTROM CONSOLIDATED DYNAMO AND MOTOR CO., OF BALTIMORE, MD.,

MANUFACTURERS OF



ELECTRICAL APPARATUS,

ELECTRIC MOTORS FOR ALL WORK,

Dynamos for Incandescent Lighting.

SPECIAL FEATURES:

High Efficiency. ✳ Slow Speed.

For full information and circulars address,

CHADBOURNE, HAZELTON & CO.,

SOLE SELLING AGENTS FOR U. S.,

416-420 WALNUT ST., PHILADELPHIA.

AGENTS WANTED IN ALL LEADING CITIES.

INTRODUCING ENTIRELY NEW PRINCIPLES.

Pat. Mar. 19, 1889. THE OLD STYLE.

THE ACME LINK BELT

IS MADE ONLY BY THE

Page Belting Company, Concord, N. H.

BRANCHES: Boston, New York, Chicago, San Francisco. Also, manufacturers of all the staple grades of Leather Belting and Lacing. Send for Illustrated Catalogue—a valuable treatise on belting, Free.

The Mitchell Vance Company

(SUCCESSOR TO MITCHELL, VANCE & CO.)

DESIGNERS AND MAKERS OF

ARTISTIC

Electroliers & Combination Fixtures

FOR ANY SYSTEM OF INCANDESCENT ELECTRIC LIGHTING.

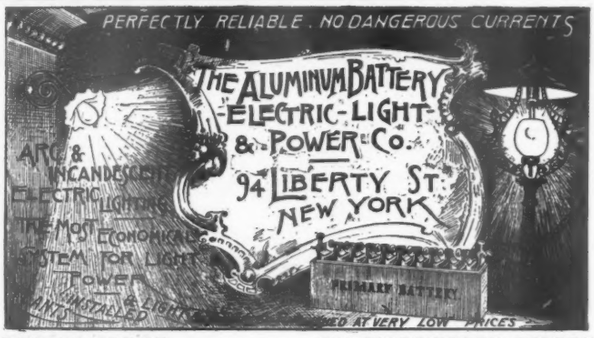
The feeling is growing that these goods should be specially adapted to the light medium; to meet this want New Designs of Artistic merit and unexcelled finish have been originated which commend themselves to intending purchasers, being shown in Parlors illuminated by Electric light.

Architects and Decorators Designs and suggestions carried out with fidelity to the given motive.

MANUFACTORY, 24th & 25th Sts. & 10th Ave.

SALESROOMS, No. 836 & 838 BROADWAY,

NEW YORK.



BOSTON OFFICE, - - 339 WASHINGTON STREET.

NEW HAVEN OFFICE, - - - 94 CHURCH STREET.

THE WESTON STANDARD

VOLTMETERS AND AMMETERS.

These instruments are the most accurate, reliable and sensitive, portable instrument ever offered. A large variety of ranges to meet the requirements of all kinds of work.

SEND FOR ILLUSTRATED CATALOGUE.

Address,

WESTON ELECTRICAL INSTRUMENT CO.,

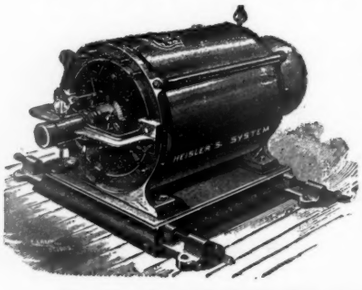
Office and Factory 114 William St., NEWARK, N. J.

THE

HEISLER PATENT LONG DISTANCE INCANDESCENT ELECTRIC LIGHT SYSTEM

Awarded the Highest Distinction, a Gold Medal, at the Paris Exposition, 1889.

UNEQUALLED FOR DISTRIBUTION OVER WIDE AREAS.



Specially adapted for Street, Commercial and Domestic Illumination from Central Stations. Plant may be located where Power can be secured Cheapest, even if Miles Distant from the Lighting. Safety, Reliability, and Financial Success fully Demonstrated. Plan of Wiring the Simplest, Cheapest, and Most Efficient. Strictly Series. Lamps, 10 to 100 Candle Power. Long Life without Blackening. Dynamo Self-Contained and Automatic.

SEND FOR CIRCULARS. CORRESPONDENCE SOLICITED.

HEISLER ELECTRIC LIGHT CO., 809 to 817 South Seventh St., ST. LOUIS, MO.

GREAT WESTERN ELECTRIC SUPPLY COMPANY,

190 192 FIFTH AVENUE, CHICAGO.

The larger part of our store being still in the hands of carpenters and cabinet makers, we have not as yet filled it with the general stock intended, still we have a large stock ready to ship from, prominent among which we would especially mention

SIMPLEX WIRES, BRYANT SWITCHES, FUSE WIRE CUT-OUTS, CLEATS, RUBBER TAPE, POLE STEPS, CROSS ARMS, INCANDESCENT STREET HOODS.

We can fill orders promptly for Bernstein Incandescent Lamps, Russell Mast Arms and General Electric Light Supplies.

GOOD FIGURES ON POLES.

WILL YOU BUY

An Incandescent Lamp, claimed to take a SMALL AMOUNT of CURRENT at first, but which really takes DOUBLE THAT AMOUNT after a comparatively SHORT SERVICE;

OR,

An Incandescent Lamp taking a MODERATE and UNIFORM AMOUNT of current, and giving LONG LIFE at its rated candle power

?

YOU HAVE NO USE FOR THE FORMER.

WE MAKE AND SELL THE LATTER.

SAWYER-MAN ELECTRIC CO.

510-534 WEST 23d STREET,

NEW YORK.

OFFICES IN ALL THE PRINCIPAL CITIES.

Fort Wayne Electric Company,

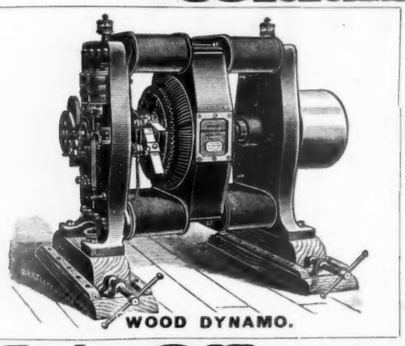
FORT WAYNE, IND.

The most carefully worked out and Complete Alternating System of Electric Lighting in existence.

ARMATURES AND CONVERTERS GUARANTEED.

12 16-candle-power Lamps to the mechanical horse power guaranteed

CORRESPONDENCE SOLICITED.



WOOD DYNAMO.

MANUFACTURERS

—OF THE—

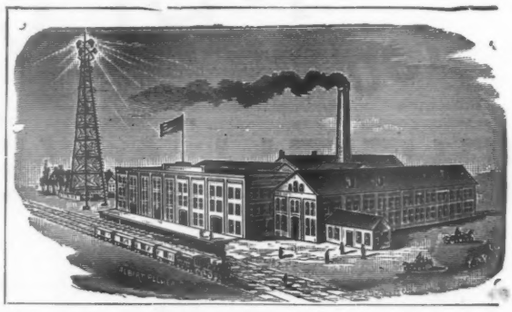
Slattery Induction System

OF INCANDESCENT LIGHTING,

—AND THE—

"WOOD" SYSTEM

OF ARC LIGHTING.



Main Office and Works, Fort Wayne, Ind.

NEW YORK OFFICE, Rooms 25 and 27, 115 BROADWAY,

H. C. ADAMS, Manager.

Manhattan Electric Light Co., 511 Broadway, Sole Licensees and Agents for N. Y. City and Brooklyn

CHICAGO OFFICE, 185 Dearborn St., W. J. BUCKLEY, Manager.

PHILADELPHIA OFFICE, 907 Filbert St., G. A. WILBUR, Manager.

PITTSBURGH OFFICE, 533 WOOD STREET.

SAN FRANCISCO OFFICE, 217 SANSOME STREET.

F. ADAMS SUC'S. CITY OF MEXICO.

THE TUCKER ELECTRICAL CONSTRUCTION COMPANY,

Agents for the Mather System of Incandescent Lighting.

AUTOMATIC REGULATION!

EXTREME SIMPLICITY!

HIGH EFFICIENCY!

ECONOMY OF OPERATION!

FREEDOM FROM SPARKING!!

ESTIMATES FURNISHED ON APPLICATION.

CORRESPONDENCE SOLICITED.

THE TUCKER ELECTRICAL CONSTRUCTION COMPANY,

14—20 WHITEHALL ST., NEW YORK CITY.